amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

JULY, 1972

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6AU6	1.61	6X9 (ECF200)	2.09
6AU7	2.87	6Y6G	3.18
6AU8	3.06	6Y9 (EFL200)	2.30
6AV6	1.35	12AT7 (ECC81)	0.75
6AW8A	1.93	12AU6	1.78
6AX4GT	1.84	12AU7A (ECC82)	1.72
[illegible]	3.68	12AX7 (ECC83)	1.95
6BD7 (EBC80)	1.30	12BE6	2.02
6BE6 (EK90)	1.68	12SN7GT	3.18
6BH6	1.61	16A5	2.15
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[illegible]	1.86		

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COVER STORY

Our Technical Editor, Bill Rice, VK3ABP, trapped by the photographer whilst doggedly working through one of the forthcoming articles.

(Photo by VK3YAZ and VK3ZU)

QSP

Required:
X x 75c > Y x 40c

Mathematics and Amateur Radio do not appear to be a miscible combination but nevertheless arithmetic and simple mathematics must be of some concern to the Amateur in the technical pursuits of his hobby. The Federal Council in Convention at Easter got involved in some arithmetic juggling, too, but not of an electronic kind. The income versus costs for the production of YOUR magazine "Amateur Radio" were the topic and no amount of juggling could reduce the costs to a level under that of the income. Thus, the Council had to budget for a deficit for YOUR journal which means that the Institute may have to subsidise "Amateur Radio" from general funds.

Everyone knows only too well that costs have spiralled upwards in recent years—you don't need a far reaching memory to recollect when a four-penny stamp was all that was necessary for a 1 oz. letter to travel within Australia. Today it is 7 cents—over double. Tomorrow—? A far cry from the original "Penny Post" envisaged by Sir Rowland Hill. Ten years ago, the cover price of "Amateur Radio" was 2/- (20 cents). Today it is 40 cents—just double. But how much is "Amateur Radio" worth to YOU. 30 cents? 50 cents? or 75 cents? To overcome the budgeted deficit, a price in excess of that currently charged must soon be put into effect, but the magnitude of this increase CAN be reduced, but it will require that YOU, the member, must do something.

The administration and printing of the journal may be carried out by the Federal Council, but it belongs to YOU. Do YOU want to see further improvements in content and presentation? Are YOU prepared to do something about it? On past performance probably not, as apathy is a disease rampant within the general membership in recent years. YOU leave it to the President or the Secretary or one of the other willing few. YOU usually do so, so why should YOU change? If YOU don't really want "Amateur Radio" you needn't change—just let the magazine die. But are YOU really prepared to let THAT happen?

What then is required? X x 75c > Y x 40c, i.e. 75X to be greater than 40Y where X and Y are the numbers of subscribers to "A.R." in the future and now, respectively. The 40c and 75c are possible cover prices. The requirement can be satisfied if X = Y, i.e. the membership remains the same in the near future and it can even be satisfied if X < Y (X smaller than Y), i.e. the membership drops off in the future. But the most desirable state of affairs is achieved if X > Y (X greater than Y), a situation given by an increase in membership. If X >> Y (X greatly exceeds Y), then the large increase of cover price from 40c to 75c may not be necessary. This is where YOU come in. Can you make X >> Y by getting ONE more member subscription to "Amateur Radio" between now and the end of this year? Only ONE new member per member is necessary. Do YOU accept the challenge?

D. H. RANKIN, VK3QV,
Federal Vice-President, W.I.A.

OLD MAGAZINES

Mr. A. K. Ross (Ph. 03-4847, Melb.), at one time a member and working with radio back to 1925, has some old copies of "Radio and Television" and "Radio, Television and Electronics" for sale if any collector of these items is interested. Please ring him first for an appointment.

ZM

"Break-In" for May announced that ZM prefixes have been approved by their Post Office for use by Amateurs from 3rd June, 1972, to 2nd February, 1974, in celebration of the 1974 Commonwealth Games.

BAND PLANNING

You should not fail to read the Victorian Division Notes this month.

S.E.A. NET CONVENTION

The 1st Annual South-East Asia Net Convention at the Ambassador Hotel in Penang over the New Year holidays 1972 saw Paddy Gunasekera, 4S7PB, as the guest of honour. Others at this Convention, for which a special call 9M2TI/P was activated, included Fred Laun, HS5ABD; Big John, 9M2IR; Phil Wight, VS6DR; Keith Smith, VK9KS, and many others. The 2nd Convention is for 10th-12th November this year in Bangkok. ("Ohm" Mag., J/F '72)

INTRUDER WATCH

The R.S.G.B. recently received the new call sign GB2IW, primarily to receive and exchange Intruder Watch information. The IW organiser and sked manager is G3PSM and overseas skeds would be welcomed.

OVERLAND TEL-LINE

Issue No. 1 of the Australian Post Office News asks readers to give or loan morse keys, sounders and overland telegraph line relics for commemorative efforts and displays to mark the centenary of the line between Adelaide and Darwin completed at Frew's Ponds on 22/8/1872.

AUSTRALIAN CALL BOOK

The next edition of the Call Book is due to be revised for printing early in 1973. A decision has been made that this printing will be similar to the 1971 edition, mainly because a hard-working member of the Institute has been maintaining, free of charge to the W.I.A., a card index of all licensees. Without Ron's excellent records it would have been necessary to programe all the non-members into the EDP system preparatory to an EDP-offset printing of the Call Book. Just one of those ways in which non-members could cost the Institute a lot of money.

OUTPOST AND MARITIME RADIO SERVICES TO S.S.B.

A circular issued by the Australian Post Office public relations office in May reveals that in the change over to s.s.b. no new or replacement d.s.b. equipment will be licensed for the outpost service after 1st January next and for the maritime service (except 2182 kHz. distress) after 1st July next. Outpost control and maritime coast stations by then will be on s.s.b., but outpost stations will have till 31/12/77, ship stations above 4 MHz. will have till 1/1/78, and ship stations below 4 MHz. will have till 1/1/82 to effect the change-over. These plans are internationally co-ordinated by the I.T.U.

"A.R." FOR NEW MEMBERS

If you happen to be a new member, your first "A.R." will most likely come to you at the same time as your second issue. In other words, the two will be bulk posted together.

J.O.T.A.

A reminder that this year's Jamboree on the Air, the 15th, will be held over the week-end of 21st and 22nd October. It will begin at 0001 hours LOCAL TIME on the 21st and end at 2359 hours LOCAL TIME on the 22nd.

ONE LOOK AT THE FUTURE

The frontier of Amateur Radio is in the field of satellites. I urge those who have the responsibility for plotting the future course of Amateur Radio to look far ahead, lest the immediate problems within and outside our ranks occupy too much of our energies to the long-term detriment of Amateur Radio. (Address by A. Prose Walker, W4BW, Amateur and Citizens Division Chief, F.C.C.—courtesy "CQ", June '72.)

INTERFERENCE—NEW ANGLES

Some space is currently being given in the R.S.G.B's "Radio Communications" to interference problems and the "social blackmail" angle in having to get along with the neighbours. One writer said that t.v.i. can be dealt with, but suggested that the greater problem is posed by the transistor radio, radiogram, tape recorder "and of all things, the electronic organ". Could a station with a clean signal be restricted or closed for causing interference to unlicensed apparatus—such as the electronic organ or stereo amplifier? We have t.v.i. and b.c.i. What would this be—Hi-Fi!?

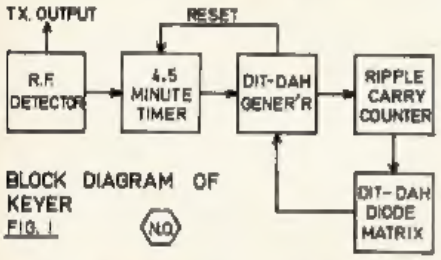
A SOLID-STATE AUTOMATIC REPEATER IDENTIFIER

R. F. DANNECKER,* VK4ZFD

The following is a description of the identifier used in VK4EI/R2, the repeater of the Gold Coast Amateur Radio Club. It was not originally intended to publish the circuit of this identifier as it is based on the W6FNO device described elsewhere. However, the number of requests received by the Gold Coast Amateur Radio Club warrants its publication.

The explanation of the operation of the device assumes a basic knowledge of digital logic and counting circuits.

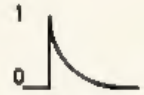
Fig. 1 shows a block diagram of the system. Figs. 2, 3, 4 and 5 show the detailed circuit of the keyer.



BLOCK DIAGRAM OF KEYER
FIG. 1 (N.O.)

The prototype was built in an enclosed aluminium box and all connections fed in through feed-through capacitors. Circuit operation is as follows:

(1) Ref. Fig. 2. The transmitter r.f. output is rectified and used to switch the SE4002 hard on. This, in turn, switches off the 2N3641 with its emitter earthed. The 400 μF. capacitor then charges through the 5.6 meg. resistor until the voltage across the capacitor is sufficient to cause the 2N3641/2N3644 synthesised SCR to switch on. Then the 2N3644 with its emitter connected to +3.6v. is saturated. Components in its collector circuit cause a positive-going pulse to be generated on the C_D rail.

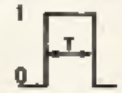


where 0 = 0 volts and
1 = +3.6 volts.

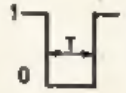
(2) Ref. Figs. 3, 4 and 5. The positive-going pulse on the C_D rail causes the 3 x MC790P ripple carry counter to be set to zero. Now the dit-dah generator receives an input from the dit rail of the diode decoding matrix.

Operation of the dit-dah generator is as follows. Consider a

transition on the dit rail. This results in a negative-going pulse being applied to the dah-blank monostable which will not switch (for the moment consider 2a, 2b and 3b simply as inverters); however, a positive-going pulse is applied to the dit monostable and the output of the monostable is

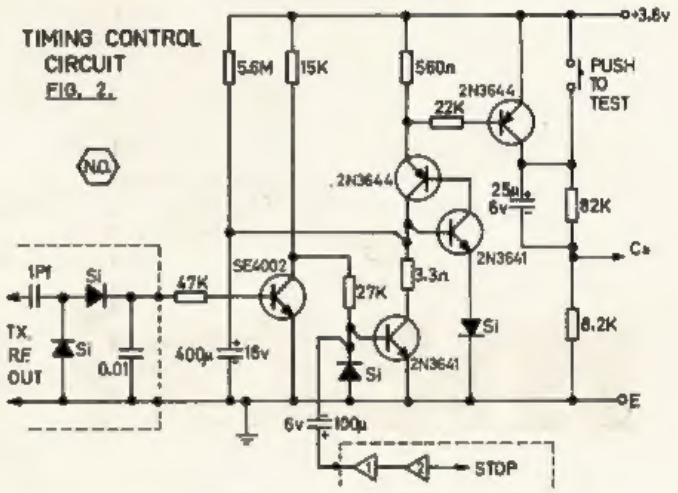


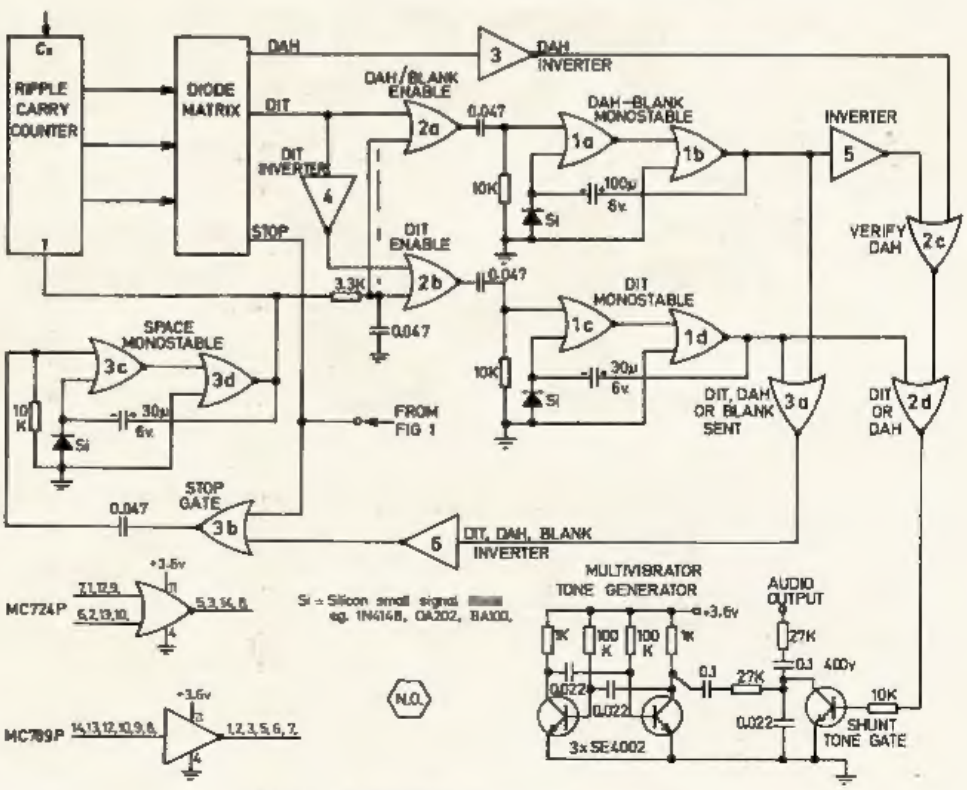
where T is determined by the time constant of the monostable. This causes a



at the base of the shunt tone gate transistor which then produces a "dit" on the audio output. A positive-going pulse is also applied to the space monostable which produces a

output which is fed to the toggle input of the ripple carry counter. On the trailing edge of this pulse the ripple carry counter steps on to the next number. Now if a

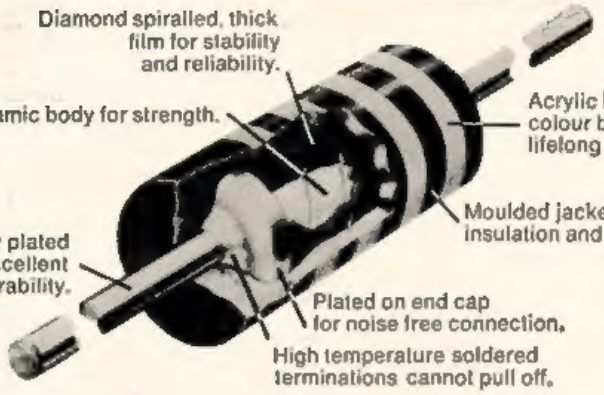




DAH-DIT GENERATOR FIG. 3.

* 52 Pohlman Street, Southport, Qld., 4215.

The very best of all...



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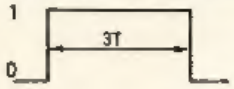
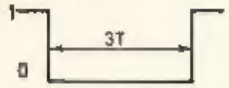
transition appears on the dit rail the dah-blank monostable produces a

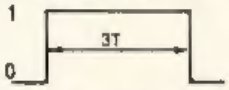


output.

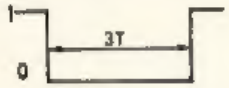
This results in a



on one of the inputs to 2c, the "verify dah" gate. If, during this period, there is a 1 on the dah rail, there is a 0 on the other input to 2c, hence a



is produced at the output of 2c. This results in a



on the base of the tone gate transistor and a "dah" is produced at the audio output. If a 0 were present on the dah rail during this period, the output of 2c would remain at 0 and no output would appear on the audio (corresponding to a blank). In an identical manner to the "dit" case, once a "dah" or "blank" has been produced, the space monostable steps the counter on to the next number. The second input to 2a and 2b from the space monostable will cause one of the two monostables to operate (after the space is produced) if a number of consecutive "dits" or "dahs/blanks" is required. Hence the timing relationship for the output is:

	CHARACTER	TONE	PERIOD
Always followed by	DIT	YES	T
	DAH	YES	3T
	SPACE	NO	T
	BLANK	NO	5T

(3) In this manner, a sequence of characters as determined by the diode matrix is produced. When the desired sequence is completed the diode matrix provides a

output on the stop rail. This is fed to the dah-dit generator where it closes the stop gate, hence preventing the counter from being stepped onto the next number. It also produces a positive-going pulse on the base of the 2N3641 transistor in the timing circuit, switching it hard on and discharging the 400 μF. timing capacitor. A simple push-button test facility is provided.

(4) With the 400 μF. timing capacitor used in the prototype it was found that a 5.6 meg resistor gave a period of 4.5 minutes. However, due to the nature of electrolytic capacitors (use a low-leakage one), the value of the resistor may need some adjustment. Note that apart from these two components the keyer is completely digital.

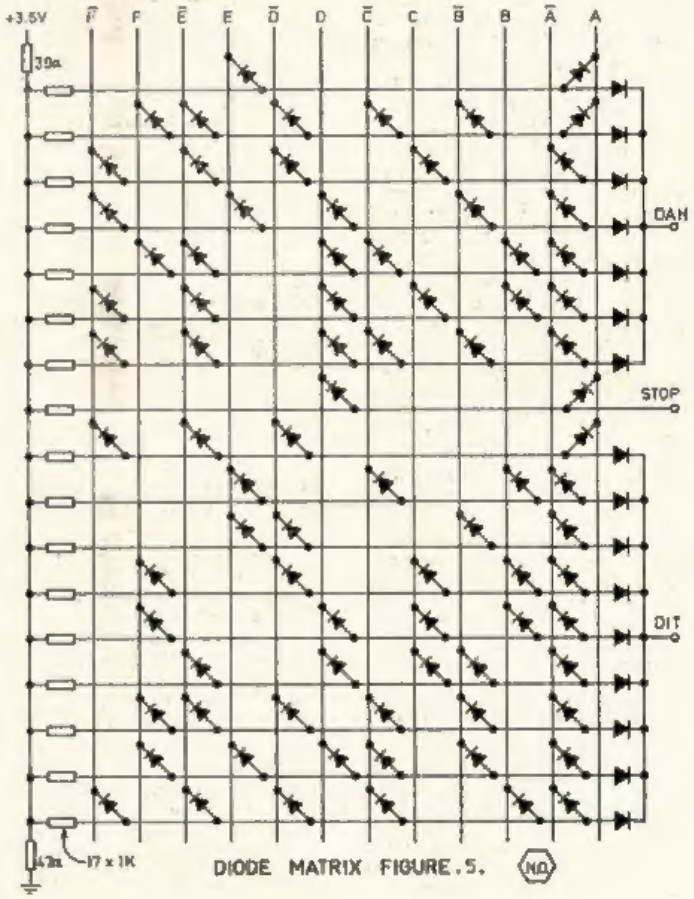
(5) Some discussion of the diode matrix is warranted. If one horizontal line of the matrix is inspected, it is found to be a diode AND gate. The output of this gate is a 1, only when the cathodes of **all** the diodes in it are connected to a 1. (Note that the additional diode on each gate, connected cathode to the dit or dah rails is necessary to prevent gates from interacting.) Hence each of the three output rails will be either a 1 or a 0 for each number on the ripple carry counter, determining the sequence of "dits" and "dahs" in the call sign.

Consider now the design of the matrix for VK4EI/R2. Since the spaces are automatically generated we may neglect them, so we have:

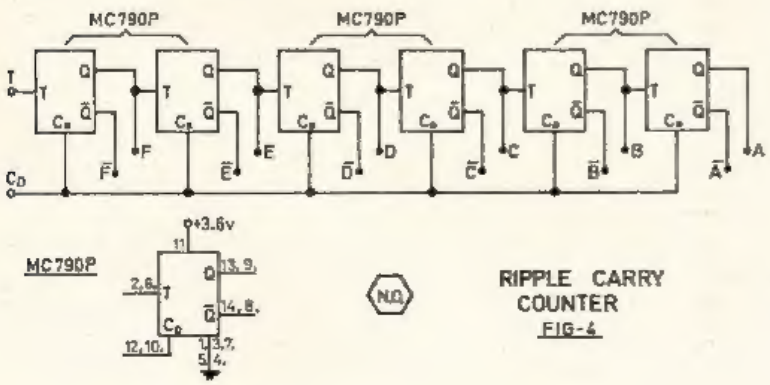
$$\cdot\cdot\cdot - B - \cdot - B \cdot\cdot\cdot\cdot - B \cdot B \cdot\cdot B$$
$$- \cdot\cdot - \cdot B \cdot - \cdot B \cdot\cdot - - - -$$

Numbering each character from the left we have:

(Continued on Page 20)



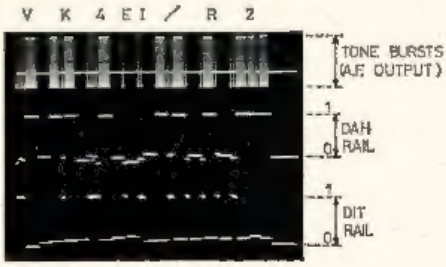
DIODE MATRIX FIGURE.5.



MC790P

RIPPLE CARRY COUNTER

FIG-4



WAVE FORMS IN KEYER FIG.6.

NEWCOMER'S NOTEBOOK

With Rodney Champness, VK3UG*

It is hoped that under this title many S.w.l's and newly licensed Amateurs can be helped along the road to becoming more proficient in the field of Amateur Radio.

Will you, the S.w.l. or new Amateur, help to make this segment of "Amateur Radio" successful—with your ideas on what you want to see discussed or described, by your constructive criticism, and by the questions which we hope you will ask.

In the past there have been very few items of interest published for the beginner, or newcomer, to this unique training pursuit and activity of Amateur Radio. Many articles are over the head of the beginner and for that matter many established Amateurs—much as they would hate to admit it.

At times circuits will be published which will either be complete in themselves or as part of a whole system. If you think you have a circuit or article that would suit this segment of "Amateur Radio" please send it in. Credits to authors are always given in "A.R." If you have circuits that you wish to be criticised please submit them, with a description of what exactly the device is intended to be and how it is expected to do it. If it is thought to be sufficiently of interest to all, it will be published along with an appraisal of its possible virtues and vices. Your name would naturally be omitted in this case.

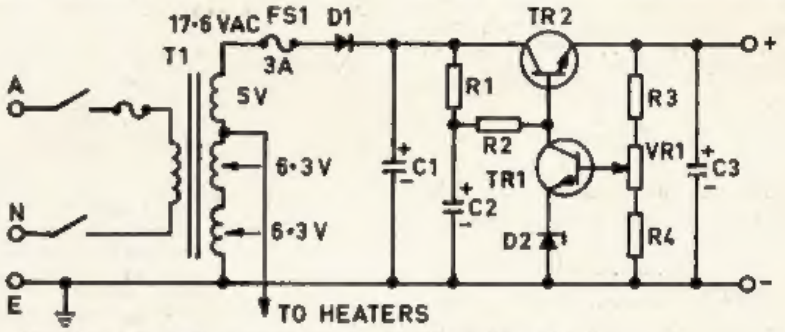
To give you an idea of the general level intended in this column, a simple 1.5 amp. transistor regulated power supply is now described.

TRANSISTOR REGULATED POWER SUPPLY

This power supply is no doubt very similar to many which have been described before in "A.R.," the only difference being extreme simplicity for what it will do. It was designed to run upwards of a 10 watt solid state f.m. v.h.f. transceiver. Because of a number of other circuit complexities not shown on this circuit, it was necessary to ground one end of the low tension secondary winding. The transformer is, in fact, an old valve type t.v. transformer. The two 6.3 volt filament windings are in series to give a 12.6 volt heater line for other equipment. The 5 volt winding was then connected in series with the 12.6 volts, giving 17.6 volts.

It would probably be thought that hum would be quite bad with only half wave rectification, but in fact no audible hum was observed. There is ripple across C1 which is to be expected. The supply is filtered by R1-C2 and very little ripple appears in the output. The effective capacity of C2 is multiplied by the beta or amplification factor of TR2, which could be as high as 100. The effective dynamic filtering is therefore 1,000 x 100 which means C2 has been multiplied in effective value, as far as hum is concerned, to 100,000 uF., which is a lot of uF.

This regulated power supply has what is called a d.c. feedback circuit designed to maintain the output voltage as near as practicable to the desired voltage. The feedback circuit consists of R3, R4, VR1, TR1 and D2. The resistors and potentiometer form a voltage divider across the output, sampling a predetermined portion of the output voltage. Current flows through R1, R2, TR1 and D2 under most conditions of operation.



SIMPLE 1·5 AMP REGULATED POWER SUPPLY

T1—Power transformer as per text.
FS1—3 amp. fuse.
D1—3 amp. 100 PIV silicon diode.
D2—5.1 volt zener diode BZY88/C5V1.
C1—2200 uF. 25 volt working electrolytic capacitor.
C2—1000 uF. 25 volt working electrolytic capacitor.
C3—100 uF. 15 volt working electrolytic capacitor.
R1, R2—each 200 ohms (220 ohms), ½w. resistors.
R3—470 ohm ½w. resistor.
R4—1000 ohm ½w. resistor.
VR1—1000 ohm preset potentiometer, or normal shaft pot if variable volts required.
TR1—AC127 germanium transistor.
TR2—2N3055 silicon transistor.

D2, a 5.1 volt zener diode, does not conduct until approximately 5.1 volts are applied across it. With 5.1 volts across the zener, the emitter of TR1 is +5.1 volts above earth. For TR1 to conduct the voltage at the base of it will need to be about 5.3 volts. The collector voltage of TR1 will vary, depending on how much current is drawn through R1 and R2.

It is obvious that if the collector voltage on TR1 varies, so will the base voltage of TR2. If the base voltage of TR2 is varied, so will the output voltage. It should now be apparent that the collector voltage of TR1 largely controls the output voltage. The conduction of TR1 is determined by the proportion of the output voltage applied to the base.

Fair enough you might say, but how does this system control the output voltage? Take a typical situation, say, where the output is 10.6 vlots. VR1, the output volts potentiometer, will be set so that 5.3 volts are presented to the base of TR1. To maintain this output the collector of TR1 and base of TR2 will assume a voltage of 10.6 volts plus the drop in the base emitter junction of TR2 of 0.6 volt, which is 11.2 volts. All is in equilibrium at say a drain of 500 mA. Now suddenly the current increases to 1.5 amps., momentarily the voltage may drop to 10 volts. The base of TR1 will receive 5 volts so no current is drawn, the voltage immediately rises at the base of TR2 and it conducts more, so that the output voltage soon rises to **nearly** 10.6 volts again. Nearly is used on purpose—TR1 will receive not quite 5.3 volts which means that it does not conduct as much and therefore the voltage at the base of TR2 will be higher to allow for the increased drop across the base emitter junction, which may be, say, 0.1 to 0.5 volt more than before—depends a lot on how much current is being drawn and the type of transistor used as the series losser.

If the load is reduced, the voltage in the output will rise, so the converse situation arises and TR1 conducts more heavily, hence the voltage is brought down to normal. You can consider that TR2 is a rheostat which is electronically adjusted to give a certain output voltage under varying load conditions.

Under no load, or say 0.1 amp. load, the voltage across C1 may be 25 volts, the output voltage may be 10 volts. TR2 acts as a resistor then of 150 ohms. $E \div I = R$, $E = 15$, $I = 0.1$. Now with a load of, say, 1.5 amps., the voltage across C1 may only be 20 volts, with an output of 10 volts. TR2 this time acts as a resistor of 6.6 ohms. This change is done virtually instantaneously.

What happens if the current drawn greatly exceeds 1.5 amps.? R1 and R2 are selected so that when the base current of TR2 increases dramatically with a short on the output, the voltage drop across the resistors R1 and R2 increases greatly, which means the base of TR2 has quite a low voltage applied to it, therefore the output voltage is low. The exact value of R1 can be experimented with by inserting a potentiometer in series with it and adjusting it until with just over the designed maximum current drawn the output voltage begins to fall. TR1 and D2 would at this time not be drawing current and the supply would now be unregulated as excess current is being drawn from it. TR2 is now being starved for base current so the supply does in fact have a simple type of overload. If the overload exists for a second or two, the fuse will blow as well.

One final point about this particular supply. Do not put another electrolytic capacitor at the base of TR2 if you want long life out of the transistor under overload conditions. Why is this so? If a capacitor is placed at this

(Continued on Page 10)

* 24 O'Dowds Road, Warragul, Vic., 3820.

USING THE LM373*

RAYMOND MEGIRIAN, K4DHC

• About two years ago a new integrated circuit was announced by National Semiconductor and was labelled the LM373. Inside the little TO5 can were the makings of four gain stages, an a.g.c. section, a balanced mixer and a peak detector. At least that's what the poop sheet said, and circuits were shown for using the little jewel in various types of i.f. strips.

I was fortunate at that time to acquire an LM373 and promptly breadboarded an s.s.b. i.f. strip to see how it would perform. It performed amazingly well and I was sufficiently impressed to start planning a receiver designed around this new IC.

Although I didn't know it at the time, all the ingredients for a classic demonstration of Edsel Murphy's Law were gathering for the final curtain. The clincher came when word got around that the manufacturer had thrown in the towel. That's when Murphy struck and left me with a crisply burned collector's item.

Now, two years later, I once again own an LM373 and have been assured by the company rep. that these items are here for keeps and are available from distributors.

The present LM373 is basically the same as its predecessor, including pin connections, although internal circuitry is somewhat changed. The device will perform many diverse functions which make it adaptable to a.m., f.m., or s.s.b. i.f. systems by merely changing a few connections. In the application described here, the IC is used in a receiver capable of operating in either a.m. or s.s.b. modes. It was made small only because my hangup is miniaturisation. It is designed to cover 3.5 to 4.0 MHz. and an all-band converter will some day be used ahead of this "tuneable" i.f. If the cabinet had been about an inch larger, I might have gone all the way right from the beginning.

Let's take a look at this new device and see how it may be used to perform the functions of particular interest to the Amateur. Fig. 1 shows how the various sections of the circuitry are tied together internally and which points are brought out to pin connections. Note that the IC is divided into two separate areas having no common internal signal path. The upper portion, consisting of two gain stages and the a.g.c. section, is externally coupled to the remaining circuitry by the main selectivity determining device. This usually consists of a mechanical, ceramic, crystal or LC filter operating in the 50 kHz. to 15 MHz. frequency range.

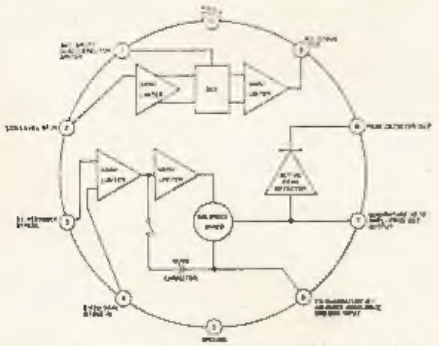


Fig. 1.—Pin connections and internal wiring of the LM373.

In order to better understand just how the various sections of the LM373 can be made to perform the desired functions, let's look at some block diagrams. Fig. 2 shows the connections used for operating in the a.m. mode. In order to disable the balanced mixer for this mode, an offset voltage is introduced at pin 6 by means of a resistor. A.g.c. voltage is taken from the output of the peak detector and connected to the a.g.c. input at pin 1 through an RC network with the desired attack/decay characteristic. An a.g.c. range of 70 dB. with operation down to 50 uV. r.m.s. input is possible with this circuit.

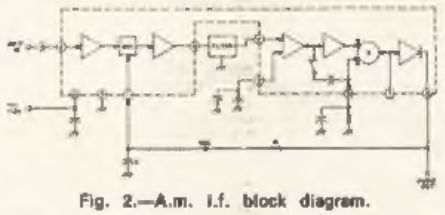


Fig. 2.—A.m. i.f. block diagram.

For s.s.b./c.w. operation, refer to the block diagram of Fig. 3. A b.f.o. signal of 25 mV. r.m.s. or greater is fed into the balanced mixer at pin 6, causing the mixer to act as a product detector. The peak detector generates an a.g.c. voltage derived from the audio fed to it from the product detector. This voltage is fed back to the a.g.c. section through the RC network.

A means of providing manual gain control for c.w. operation is also shown in the block diagram. So here we have an i.f. amplifier, a fast attack, slow release audio derived a.g.c. system and a double-balanced product detector all in one neat package.

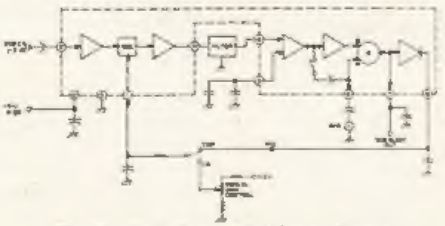


Fig. 3.—S.s.b./c.w. i.f. block diagram

Although I have not tried the LM373 in an f.m. receiver, some readers may be interested in this type of operation and Fig. 4 is the block diagram for an f.m. i.f. system. By grounding pin 1, the a.g.c. is defeated and all gain stages become symmetrical non-saturating limiters. This action also connects an internal quadrature capacitor to pin 6 which is also input A of the quadrature detector.

An LC network tuned to the nominal i.f. frequency is connected externally to pin 6. This network produces a frequency-dependent phase shift with respect to the signal at input B of the quadrature detector. A pulse duration modulated output is produced by the detector and integrated by the capacitor connected to pin 7. The Q of the quadrature network will influence both the output level and the distortion. For a given deviation, increasing Q will increase both output and distortion. At least a 50 mV. r.m.s. signal is required at pin 6 to ensure switching action of the detector and maximum output. Audio at a higher level may be taken from the output of the peak detector at pin 8.

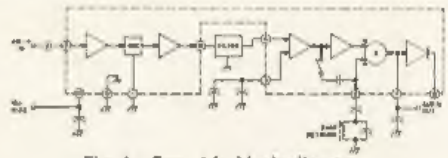


Fig. 4.—F.m. i.f. block diagram.

In addition to the applications above, this versatile IC may be used in several other interesting circuits. These include s.s.b. generator with a.l.c., constant amplitude/amplitude modulated r.f. oscillator, first i.f. amplifier/second mixer and as a video amplifier with a.g.c., manual gain or gating. There are others, too, but unfortunately we can't cover them all at this time.

If you are mainly interested in using the LM373 in your own designs, Figs. 5, 6 and 7 are schematics for use in the various modes discussed above. Notice that in all circuits, a.c. coupling is used for signal transfer. D.c. paths in integrated circuits of this nature can cause excessive currents to flow, resulting in possible destruction of the IC.

The by-passing at pin 3 should be accomplished with a low inductance

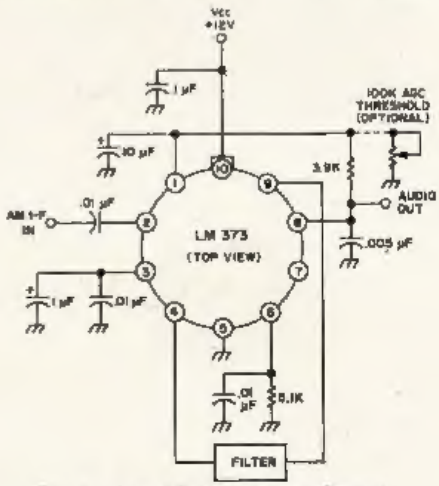


Fig. 5.—A.m. i.f. strip wiring diagram.

* Reprinted from "73 Magazine", April 1972

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high frequency capacitor and a larger tantalum for the low frequencies. You should also observe the usual rules of good layout practice and keep leads short when working with high gain circuits such as this

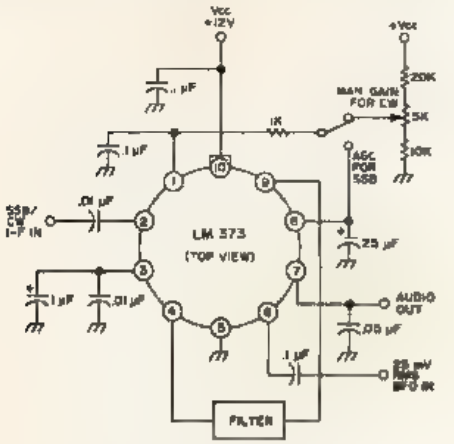


Fig 6—S.s.b./c.w. i.f. strip wiring diagram.

Fig. 8 is a schematic for the front end of the receiver I built using the LM373 in the i.f. system. The r.f. and h.f. oscillator stages both use an inexpensive 2N3819 plastic junction FET. The mixer uses a dual gate MOSFET. Another 2N3819 is used as a source follower to isolate the h.f. oscillator and prevent pulling. A small transistor type i.f. transformer couples the mixer to the LM373.

Fig. 9 is a schematic for the remainder of the receiver; including the i.f., b.f.o. and audio portions. In order to operate the i.f. system in both a.m. and s.s.b. modes, it was necessary to incorporate a 5-pole, 3-position switch, S1, to make the transfer. Two of the poles are used to switch the a.g.c. time constant components from a.m. to s.s.b. Another pole provides b.f.o. input to pin 6 for s.s.b. operation or an offset voltage for a.m. Pole number 4 selects audio output from pin 7 for s.s.b. or pin 8 for a.m. The final section applies voltage to the b.f.o. for s.s.b./c.w. reception. S2 is a small s.p.d.t. toggle

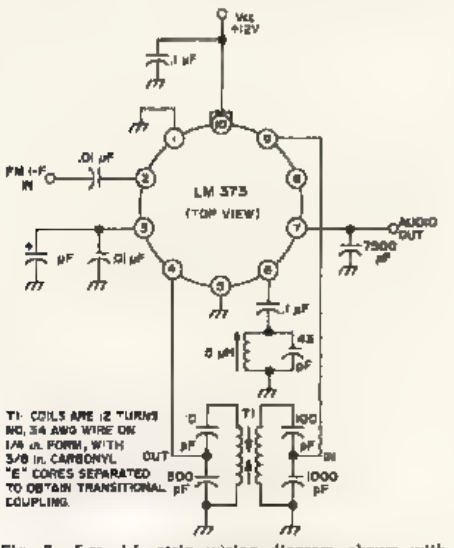


Fig 7—F.m. i.f. strip wiring diagram shown with transformer interstage coupling

switch used to go from manual gain control to normal a.g.c. when in the s.s.b./c.w. mode. The manual gain control is useful when listening to c.w.

A second i.f. transformer is used for the b.f.o. tank and is tuned by a d.c. voltage applied across a capacitor diode. I used a V47 but many ordinary silicon diodes will work satisfactorily in this application. Epoxy rectifiers are also a good bet. Depending on the frequency variation obtained, the 27 pF. series capacitor may have to be altered for proper tuning range. If range is insufficient, increase the value of the series capacitor. If b.f.o. range is greater than needed, a smaller capacitor may be used

Operating voltage for the h.f. oscillator, the b.f.o. and its tuning diode is regulated by a zener diode. Almost any small zener in the region of 6 to 7v. may be used. The base/emitter junction of a silicon transistor makes an excellent zener and no doubt several can be found with 6 to 7v. breakdowns. With these critical circuits regulated, the main supply can be varied from 9 to 15v. without producing any noticeable change in the received signal other than

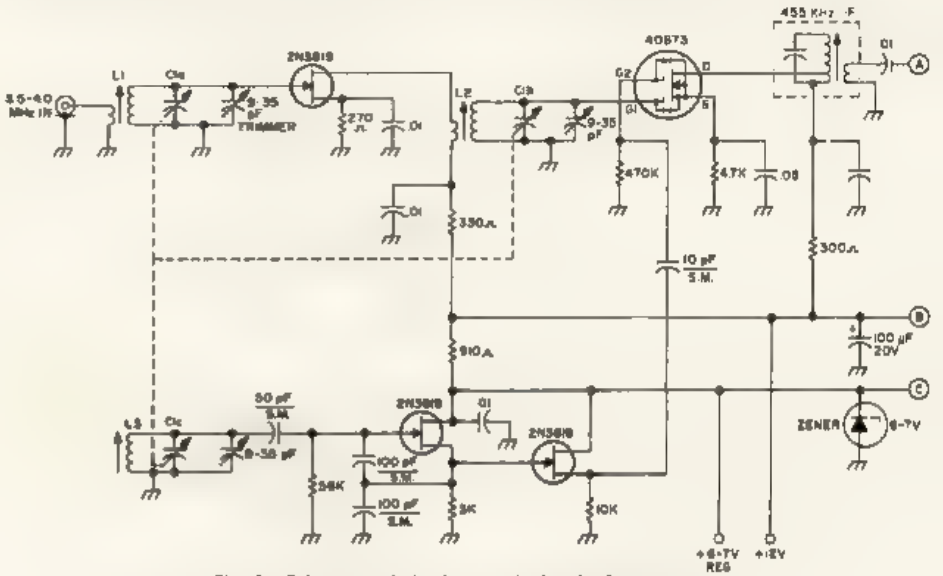


Fig. 8—Schematic of the front end of K4DHC's Receiver

Unless otherwise specified, all capacitors in µF., all resistors ¼ watt
Coils wound on micrometals No. L45-2-CT-8-4 shielded forms
C1a, C1b, C1c—Mitsumi No. 3C20, 3-gang, 20 pF. per section
L1, L2—75 turns No. 34 a.w.g., enamelled wire, primary 8 turns same wire
L3—60 turns No. 34 a.w.g. enamelled wire

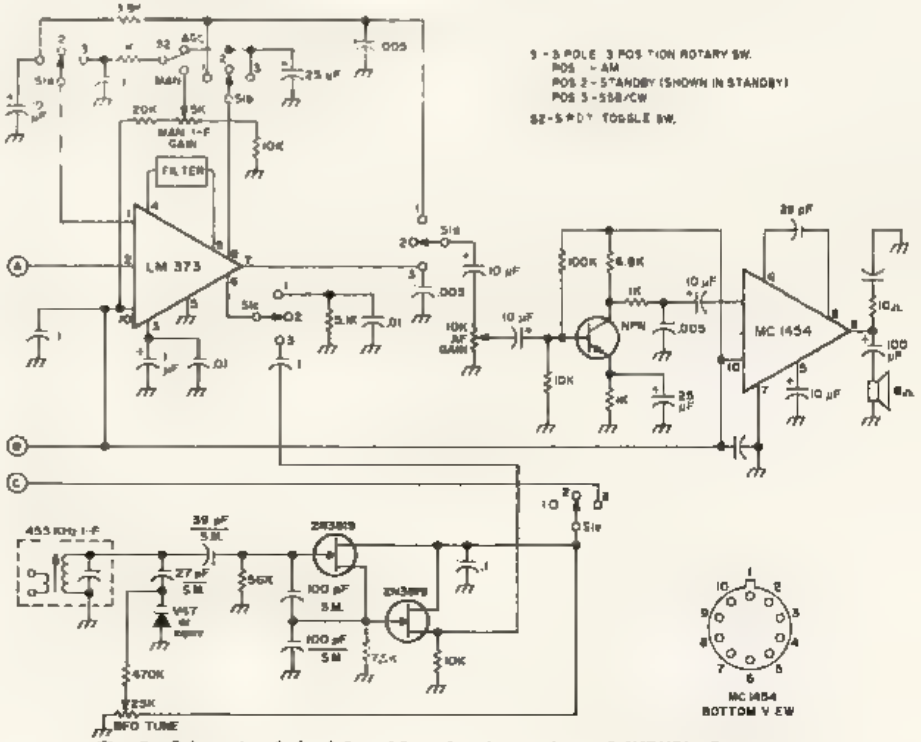


Fig. 9.—Schematic of the b.f.o., i.f. and audio portions of K4DHC's Receiver

audio output. A 2N3819 source follower further stabilises the b.f.o.

Because I wished to keep size to a minimum, I used a tiny 455 kHz. ceramic ladder filter as the interstage coupling device for the LM373. This filter, the Murata CFS-455J, has a 3 dB. bandwidth of 3 kHz. and is adequate for general use. I used a printed circuit board for assembling the receiver and arranged it to take either the ladder filter or a Murata SFD-455B dual section filter. This provides about 4.5 kHz. bandwidth at 3 dB. Because this is not a construction article in the strictest sense, and because some of the components dictated board layout not compatible with most junk boxes, a printed circuit layout has not been included.

I incorporated an audio preamp since I like to have a little reserve when it is needed. This stage can use almost any NPN audio transistor and is not at all critical. The transistor I used was an unmarked refugee from my junk box. A Motorola MC1454 IC power amplifier is used in the audio output stage. It is capable of 1w. of audio into an 8-ohm load. I've had excellent results with this IC and have used it in many projects. The small speaker built into the receiver does not do the audio justice, but does make the receiver self-contained

At present a block of 8 pen cells soldered in series powers the receiver. No-signal current drain is about 28 mA., rising to 40 or 50 mA. on audio peaks at normal room level. At these levels it is not necessary to heatsink the audio amplifier.

Construction of the receiver is unorthodox in some respects because of my desire to keep it small. Since some of the ideas used here may be of interest to others, I'll go over the main points.

The front end tuning capacitor is a tiny 3-gang film dielectric type of 20 pF. per section. It is driven by an equally small 4.5:1 ball drive attached directly to the tuning capacitor. Unfortunately, a pointer was not available for this drive, but one was fashioned quite easily and can be seen in the photograph. The three trimmers, Erie style 538, were mounted on the capacitor and the whole assembly fastened to the front panel along with the other controls. This saved considerable board space and did not add anything to the space required behind the front panel.

An additional saving was achieved by mounting as many components as possible on the mode selector switch, S1. Since panel area was scarce, I used a small diameter Japanese rotary switch having three decks with a total of nine poles and three positions. This is a Lafayette part number 99F61715 which lists for only 79c. Since it is a shorting type switch, it was necessary to use position 1 and position 3 of each section to avoid shorting circuits during transfer. An unexpected bonus resulted, however, when the middle position worked out fine for "Standby". Since the switch has many more contacts than required, unused lugs made convenient tie points for mounting the associated resistors and capacitors. With these savings, the printed circuit board for the entire receiver ended up being a 3" square.

The three-gang miniature tuning capacitor with reduction drive attached. Home-made pointer is push-fit over the large (direct) shaft.

K4DHC a miniature 75 metre Receiver utilising the LM373 in the i.f. system

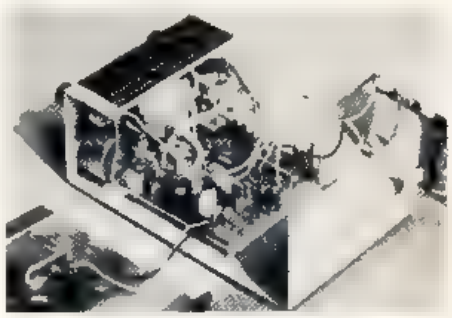
I think that most will agree that the principal limiting factor in shrinking equipment size, is front panel space. Half-inch knobs seem to be the smallest practical size, and even then you need finger room in between controls. The Ten-Tec cabinet I used is the smallest of their JW series. Actual panel space is 2¼" x 3¼". As can be seen in the photograph, there is not much room left over.

If you build up a copy of this receiver and use the specified coil forms, a suggestion may be in order. After alignment is completed, put a small ball of coil wax in the opening of the oscillator coil and melt it down with the tip of a small soldering iron. The bobbins in these coil formers sometimes do not fit tight and cause microphonics or instability in the oscillator output. The wax holds the bobbin tight and prevents any of these problems.

That covers the basic uses of the LM373 and may have set you to thinking about applying this versatile device to some of your own pet projects. It should be pointed out that the version discussed here is the limited temperature range LM373H in a TO5 can. Price is $US4.85 in small quantities. A 14-pin DIP version, the LM-373N, was to be made available at slightly lower cost but I had not checked on this at the time of writing.

Results to date using this i.f. system have been quite gratifying. The LM373 provides more than adequate i.f. gain at 455 kHz. and the a.g.c. acts without any noticeable pumping. Overall, the use of this device has drastically cut component count while providing excellent circuit performance

If you are wondering about the weird nameplate on top of the receiver, it came about because I had to cover some bad scratches and it seemed the only way to do it. ●



Interior view of the receiver. The LM373 is just behind the i.f. transformer in the middle of the board. The 3 kHz. ceramic ladder filter is just to the right. The pen cell battery pack normally sits in the space between the board and back panel of the cabinet

[For the local builders, the greatest problem will be to locate a small three-gang capacitor and this will probably limit the size of the receiver. A suitable unit will be difficult to locate and I have been unable to find anything really small.

The 40673 may be a problem, but the MPF121 seems to be a logical substitute to use.

All other components are readily available from local suppliers.

It would appear that a **white** coded miniature 455 kHz. i.f.t. would be most suited to use immediately following the dual gate mixer; be certain you use the correct tap. Any "coloured" i.f.t. could be used for the b.f.o., almost any NPN transistor could be used in the audio stage (SE1001).—A. J. Stewart, VK3AS]

NEWCOMER'S NOTEBOOK

(Continued from Page 9)

position consider the operation with a short circuit. The capacitor will have a reserve of energy which will maintain the base voltage and supply a large amount of base current. The transistor will momentarily pass a large amount of current with possible drastic results. The supply will not regulate quickly if this capacitor is there, in fact it will act very like an amplifier with a short circuit across the output. The supply must not only regulate at d.c. as it would if this capacitor were fitted, but regulate at a.c. as well to compensate for any rapid changes in load. TR1 and TR2 are a direct coupled a.c. and d.c. amplifier pair with R2 as load resistor. In theory, C3 should not even be necessary, but it is found that the regulating amplifiers are unstable if this capacitor is omitted.

If you would like to know much more about these types of power supply I would recommend that you contact the Editor of "The Australian EEB," Leo Gunther, VK7RG, and see if back copies

(Continued on Page 14)

ELECTRICAL MEASURING INSTRUMENTS

LECTURE 15B

C. A. CULLINAN,* VK3AXU

● Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

Factors Effecting Meter Accuracy

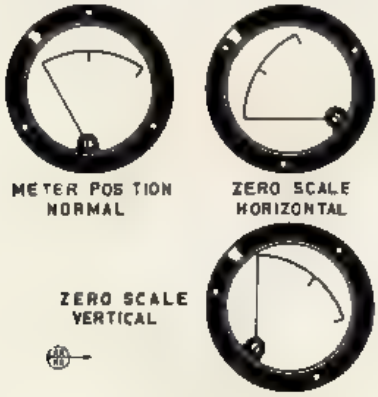
"The manufacturer's nominal accuracy rating does not insure accurate results from a meter in the hands of an inexperienced technician or an instrument which has been subjected to abuse. The following tabulates some of the mechanical and operational factors which may cause large errors in the reading of d.c. meters of the D'Arsonval type.

"(a) Stray magnetic field errors. Since the deflection of the meter depends on the strength of the permanent magnet, serious errors may be introduced by stray magnetic fields from other meters, current carrying conductors, magnets and other ferrous materials. Expensive meters are usually provided with adequate magnetic shielding. Some errors are also caused by mounting small meters in heavy steel panels Meters especially calibrated for such mounting are usually so marked.

"(b) Balance errors. The delicate system of counterweights which balance the moving-coil assembly may cause 'zeroing' or reading errors if improperly adjusted. The balance of the movement may be checked by holding the meter in the three positions shown in Fig. 6. If the pointer does not indicate zero in each position, the movement is not perfectly balanced. Unbalance is most serious in vertical mounted meters.

"(c) Overload errors. Permanent damage or burn-out may be caused by repeated or heavy overloads of the meter movement. Excessive current through moving-coil types causes heating of the coil and springs. Heating of the latter results in 'annealing' or loss of spring tension which impairs accuracy. Overloads also cause needle 'banging' which may damage pointer or pivots

"(d) Sticky movement errors. The meter movement may be prevented from moving freely by several mechanical defects. Chief among these is chipped jewels or damaged pivots due to rough handling. Sticking may be manifest in the failure of the meter to reproduce a known reading when approached from values above and below the known value. Light tapping of the meter case is frequently resorted to as a cure. Meter sticking is also caused by small magnetic particles which may be gathered by the magnet of a meter which is removed from its case and left unprotected."



TEST FOR MOVEMENT BALANCE

FIG. 6.

* 6 Adrian Street, Colac, Vic., 3250.

An exceptionally fine article on the moving-coil meter by K. A. Kimberley, VK2PY, appeared in the July 1970 issue of "Amateur Radio" and is well worth studying.

Moving-coil instruments measure the mean value of a current and therefore do not indicate on alternating currents with the exceptions noted earlier.

Moving-coil instruments are accurate and their volt-ampere requirements are very small since suitable torques may be provided by the use of strong fields. The usual scales are uniform over an arc of about 120 degrees, but by using specially shaped pole-pieces the arc may be extended to 270 degrees.

The development many years ago of suitable copper-oxide rectifiers, and more recently germanium and silicon rectifiers, together with the excellent torque and damping characteristics brought about the use of moving coil meters, with bridge-connected rectifiers, for the measurement of a.c. voltages and currents, calibrated in r.m.s. (root mean square) or effective values (both these expressions mean the same thing).

Such meters may have temperature and wave-form errors. As far as wave-form errors are concerned, the meter registers the mean value and is calibrated in r.m.s. values, and even with sinusoidal waves the rectifier itself may modify the wave-form. In voltmeters there may be an additional error due to the inductance and stray capacitance of the series multiplying resistor. In good a.c. voltmeters of this type non-inductive resistors, having very low stray capacitance within themselves, are used.

As far as ammeters are concerned the rectifier capacitance may affect the frequency response

VU METERS

For many years the Broadcasting and P.M.G. Services have used special moving-coil rectifier meters for the measurement of programme levels. These are known as VU meters (volume units) and were designed in the U.S.A. about 1938 to overcome the problems that existed because of the lack of standardisation in measurements of programme levels between the various telephone companies, broadcasting and recording organisations.

dB meters were in common use with such references as "zero" dB. being 1 milliwatt in 500 ohms, 6 milliwatts in either 500 or 600 ohms, or 12.5 milliwatts in 600 ohms. Then there were heavily damped (slow), lightly damped (fast), and peak-reading meters. With the latter the forward movement of the pointer was very fast, but the return was very slow.

Brief specifications for the VU meter are:—

Frequency response to be flat within 0.2 dB. from 35 Hz. to 10 kHz., and within 0.5 dB. from 25 Hz. and 16 kHz.

Harmonic distortion. The harmonic distortion introduced into a 600 ohm circuit by bridging a VU meter across it is to be less than 0.2%. When making harmonic distortion measurements on equipment at very low levels it is common practice to substitute a non-inductive resistor for the VU meter because the harmonic distortion in the VU meter may cause erroneous readings. (Many dB. meters will produce as much as 0.5% distortion.)

Temperature effects: The deviation in sensitivity with temperature to be less than 0.1 dB. for temperatures between 50°F. and 120°F. and less than 0.5 dB. for temperatures as low as 32°F.

Impedance The impedance for bridging across a line must be 7,500 ohms. The instrument impedance is built out to 3,900 ohms and an external resistor of 3,600 ohms is added to make the total impedance 7,500 ohms. The external resistor is of the non-inductive type. A T type attenuator may be inserted between this resistance and the instrument if the meter range is to be extended.

Because sufficiently powerful magnets were not available in 1938 it is standard practice for the meter to indicate 0 on its scale when a 1,000 Hz. potential of 1.228 volts (+4 dB. above 1 milliwatt in 600 ohms) is applied to the meter and its external resistance of 3,600 ohms. Thus "zero" VU on the meter scale is +4 VU in practice. The actual reference is Odbm. = 1 milliwatt in 600 ohms.

There is a choice of two scales and the standards for VU meters also cover the dynamic and overload characteristics.

Unfortunately, shortly after the VU meter was standardised in the U.S.A. one network departed from the standards. Now-a-days we have all sorts

of amplifiers, tape recorders and meters which use so-called VU meters and bear little resemblance to the standard VU meter.

The Australian Broadcasting Control Board, in its Standards for the Technical Operation of Medium Frequency Broadcasting Stations, second edition, June 1968, defines the standard VU meter as follows —

"Standard VU meter means a volume indicator in conformity with Standard C16.5 of the U.S.A. Standards Institute, or with such other standard as the Board may approve."

Earlier it was shown that the range of a d.c. moving-coil ammeter could be increased by the use of shunts, but this does not apply usually when measuring a.c. currents with a moving coil meter having a rectifier because the resistance of the shunt will remain constant whereas the resistance of the rectifier will vary. As a result, the scale will be very cramped at the beginning, the cramping becoming greater as the shunted current increases

Measurement of a.c. current with this type of meter is done by using a current transformer. For instance, a very popular general purpose meter is the Palec Model M32A. This meter, for alternating currents, requires a current transformer designed for 1 milliampere in the secondary for full-scale deflection of the meter pointer. Some current transformers are tapped so that the meter may be used to measure a wide range of alternating currents.

One of the advantages of the rectifier type of moving coil a.c. voltmeter is that it is possible to make the scales above about 3 volts linear and to be the same as the d.c. voltage scales. However for 0-3 volts a.c. a special scale is used, but there are some meters with special circuitry where all the d.c. voltage scales are used for a.c. voltages, then there are other makes of meters where the d.c. and a.c. scales are completely different, so that with multimeters there may be very few scales or a multiplicity of them.

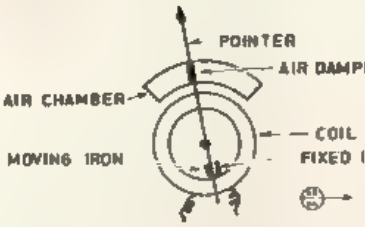
However, there is one disadvantage in using this type of a.c. voltmeter in the vicinity of radio transmitters and this is that the meter may pick up sufficient r.f. energy that it will give false readings. This is the reason that it is usual for "moving iron" voltmeters to be used in broadcasting and communications transmitters to measure a.c. voltages as they are not affected by r.f. energy.

MOVING IRON METERS

The moving iron instrument is the commonest type used in a.c. measurements although it may be used on d.c. There are two types. In the first, there is a fixed coil of wire through which current flows An iron vane, attached to a pointer, is attracted into the coil when current flows, the zero position of the pointer being determined by springs as in the moving coil instrument.

The second type of moving iron instrument has a piece of iron which is rigidly fixed in position near another piece of iron which is free to move on pivots, with a pointer attached and controlled by springs. Current flowing through a fixed coil magnetises both pieces of iron similarly, hence they repel each other. This is the commonest type of moving iron meter. Moving iron meters require more volt-amperes for their operation than rectifier moving coil meters. The scales are generally restricted at both ends, but open in the centre.

Fig 7 shows the essentials of the repulsion type of moving iron meter, using air damping, by means of a small vane attached to the pointer and moving in an air chamber.



REPULSION TYPE MOVING IRON METER
FIG.7.

Nickel iron alloys are usually employed to reduce the hysteresis losses and a high degree of accuracy can be obtained.

As the operating torque depends on the square of the current through the coil, these meters read on both a.c. and d.c. and are calibrated in r.m.s. values On rectified systems they read r.m.s. values and give different readings to moving coil instruments.

Ranges of moving iron ammeters may be from one ampere to about 300 amperes for self-contained instruments. For higher ranges an ammeter of between one and five amperes full scale may be used with a suitable current transformer, the scale being calibrated in terms of the full current flowing through the primary of the current transformer

Instrument transformers will be described later in this lecture.

Moving iron voltmeters are connected across the line for voltages up to about 600 volts, through a series resistor which is frequently external to the instrument. For higher voltages, especially for switchboards, a high value resistance may be placed in an insulating cage for protection of personnel or a voltage transformer may be used. It is common practice to use a meter having a full scale deflection of 110 volts, the scale being calibrated in terms of the actual line voltage.

Also, it is normal practice for the full-scale value to be in excess of the normal current or voltage being measured. Thus a voltmeter for use on a 240 volt circuit may be scaled 0-300 volts

For instance, here at 3CS we have a number of moving iron voltmeters having full scale markings of 500 volts. By means of suitable switching, these meters are used to read the voltages between any phases in a three-phase system in addition to reading the voltage between any phase and neutral in a.c. power systems.

Moving iron instruments should read the r.m.s. value of an alternating current, but this is not always correct, as an harmonic present in the current wave may reach a high value of induction where the B-H curve is nearing saturation, thus a very bad wave-form can lead to an incorrect reading.

Moving iron meters do not give accurate readings at frequencies much above 60 Hz. as eddy currents lead to losses and low readings. However there are some instruments of this type available with uniform accuracy over the range of 25 to 500 Hz.

The usual scale arc is between 90° and 120° although there are some designs with extended scales to 270°.

Damping may be by means of a vane moving in a restricted air space, as in Fig. 7, or by eddy currents induced into an aluminium disc which is attached to the pointer spindle

The main advantages of the moving iron meter are that it is immune to radio frequency fields, is cheap to make, and can be made very accurate.

DYNAMOMETER INSTRUMENTS

If the permanent magnet of the moving-coil meter is replaced with an electro-magnet the instrument becomes an electro-dynamic or dynamometer type. Accuracy is high and depending on the connections of the two coils a voltmeter, ammeter or wattmeter is obtained. As a wattmeter the scale is linear, but as a voltmeter or ammeter it is square-law.

Normally the dynamometer type uses air-cored coils, but with the development of better grades of iron, such as nickel-iron low-loss alloys, the accuracy remains the same as for the air-cored types but the presence of the iron leads to higher torque. This type of instrument is known as a "ferro-dynamometer" type.

For ammeters and voltmeters the coils are connected in series and for a wattmeter one coil is connected across the line and the other in series with it, so that the load current flows through it. The series coil is known as a current coil, whilst that across the line is known as a voltage or "pressure" coil.

If the inductance of the voltage coil is ignored then the current flowing through it is in phase with the voltage and proportional to it, and the torque is proportional to volts × amperes × cos ϕ, the true watts, cos ϕ being the power-factor of the load.

The inductance of the voltage coil and its mutual inductance with nearby metal parts of the instrument introduces a phase angle "d" into the voltage coil, thus producing an error into the reading. The correction factor is equal to the ratio: True Watts = $1 + \tan^2 d$, and the wattmeter reading is $1 + \tan d \tan \phi$.

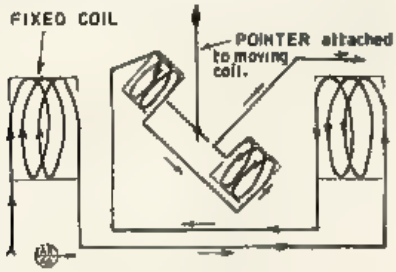
Frequency errors will occur because of the inductance of the voltage coil, hence wattmeters of this type are usually calibrated for one frequency only.

There are several other errors that can occur in a dynamometer wattmeter.

For true measurement of a.c. power **the current in the voltage coil must be in phase with the voltage which produces it.**

Because of the inductance of the voltage coil this condition is not met, so means must be taken either to make the reactance of the coil very small

or by introducing an angle of lead to compensate for the angle of lag caused by the inductive reactance of the coil. If the coil is made of relatively few turns, then it can be connected in series with a high value of resistance (which should be non-inductive). The voltage coil and resistance can be connected across the line and the current in the coil will be sensibly in phase with the voltage. The other method is to shunt the voltage coil with a suitable capacitor.

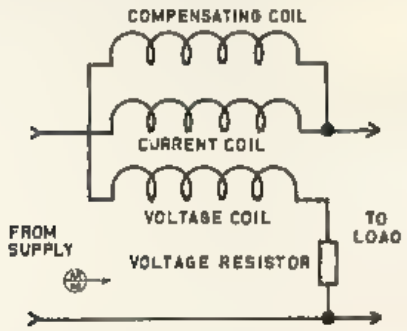


AN AIR-CORED ELECTRO-DYNAMIC TYPE OF INSTRUMENT
FIG. 8.

The wattmeter then reads true power. Temperature compensation is made within the instrument so that its accuracy remains constant over a wide temperature range.

A problem arises if the power is to be measured in a circuit having a very low power factor as the current and voltage may be equal to the full rated values of the meter, involving the maximum losses in the instrument itself so that the measured power may approach zero, thus giving a completely false result.

This state of affairs may be overcome almost completely by using a compensating winding.



CIRCUIT OF A COMPENSATED WATT-METER
FIG. 9.

The compensating coil is wound, turn by turn, with the current coil so that a given current passing through either coil would produce the same flux in the same place.

The compensating coil, at one end, is connected to the load side of the current coil, whilst the other end is connected to the voltage coil, which in turn is connected to a series resistor thence to the other load line.

Thus the combination of the resistor, voltage coil and compensating coil are connected (in series) across the load side of the wattmeter.

Because of this connection the current coil always carries the current which flows in the voltage coil, but the amount of flux which this current produces in the current coil is cancelled by the current flowing in the compensating coil, producing a flux which opposes the first because of the manner in which the compensating coil is connected.

Complete compensation cannot be achieved as it is impossible to wind the current and compensating coils so that they each occupy the same space. However, it is only in cases of exceptionally low power factor that this instrument is not suitable.

Wattmeters may be used on polyphase circuits as well as single phase circuits. In some cases two or more meters are used and in other instances a multi-element wattmeter may be employed.

A wattmeter indicates the power at the time that the reading is made. Wattmeters measure "true" power taken by a load, the "wattless" power not being registered.

For measurement of power over a period of time watt-hour meters are used.

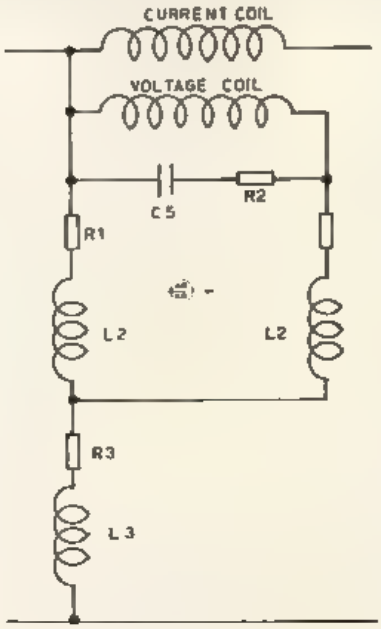
VAr METER

The reactive power in a circuit is given by $Q = VI \sin \phi$ and the unit of measurement is the VAr (meaning volt-ampere reactive). It is the rate of change of energy which is stored in the electric and magnetic fields of the system.

It can be measured in a single phase system by using a dynamometer type of instrument if the current in the voltage coil is made to lag 90° behind the voltage. Then the torque is proportional to $VI \cos (90° \pm \phi) = \pm VI \sin \phi$.

This can be done by winding the voltage coil to have as much inductance as possible.

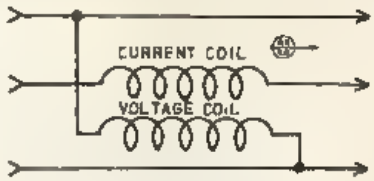
The circuit of one make of VAr meter is shown in Fig. 10. Reactances C5 and L2 compensate for the effects of the resistances R3 and R1 and the mutual coupling between the current and voltage coils.



CIRCUIT OF ONE MAKE OF VAr METER
FIG 10

This type of instrument indicates correctly only at the frequency at which it was calibrated. The instrument uses a zero centre scale and when in use the deflection of the pointer from zero not only indicates the reactive power but whether it is leading or lagging.

For three-phase systems a single wattmeter can be connected to read VAr, the power being taken as three times the meter reading. A simplified circuit of a single phase wattmeter connected for three-phase VAr working is shown in Fig. 11.



WATT-METER CONNECTED TO SHOW VAr IN A THREE-PHASE CIRCUIT
FIG. 11.

There is another type of a.c. wattmeter known as the induction type. The "Lipman" type consists of a core with two windings, voltage and current, and are connected so that their fields are 90° apart. The moving element consists of a circular disc or cylinder. A third winding, in series with a small adjustable resistance, is wound in the form of two small coils around two legs of the core. The resistance is adjusted to alter the flux produced by the voltage coil, so that the meter is compensated for power factor. The scale is linear, being the product of volts × amperes × cos ϕ.

Important.—Unless otherwise stated by the manufacturer, a wattmeter, either electro-dynamic or induction, measures the "true" power as the power factor is not measured.

Sometimes VAr meters are incorrectly referred to as wattmeters and care should be taken in answering a question on wattmeters not to confuse the VAr meter with either the electrodynamometer or induction types of wattmeters. Also, a wattmeter is not a watt-hour or KwH. meter. These will be discussed later.

Wattmeters described so far have been for use at power line frequencies. Audio frequency and radio frequency wattmeters are not discussed in this lecture. ●

NEWCOMER'S NOTEBOOK

(Continued from Page 10)

of this experimenters' magazine are available.

The two transistors and the power diode must be mounted on heat sinks. If more than 1.5 amps are required from a power supply of this design it is suggested the AC127 be replaced with an AC187, the zener with a 1.3 watt unit BZY96/C5V1 and replace the power diode with one capable of 6 amps. R1 and R2 would need to be reduced to approximately half if the supply is to put out twice the current of the one described. A full wave bridge rectifier can be used if so desired. The output voltage is adjustable from about 7 to 15 volts via VR1. ●

Commercial Kinks

With Ron Fisher, VK3OM*

It seems that I hit on the right subject for the June issue. During the last couple of weeks several letters have come in requesting information on the Trio 9R 59D series of receivers, so this month I will present a little more modification data on this set.

I am quite surprised at the number of requests that have come in for information and circuit details on the various carphones. As I have never taken a great deal of interest in this aspect of our hobby, my data on carphones is very limited. If you have circuits or know someone who has, please let me hear about it. I would be more than happy to pay any out-of-pocket expenses. If successful, we might be able to set up a full information service on all the available carphones. Now it's up to you.

TRIO 9R 59D

One of the major problems with low-priced receivers is frequency drift or other forms of front-end instability. I have always felt that there are strict limits to the improvements that can be achieved in receivers of this type. Therefore please do not expect that a few or even a lot of modifications will turn your Trio into something that will rival a Collins 75S3. It just cannot happen. However, small improvements are often very worth while.

So saying, let us take the bottom plate off the Trio and have a look inside. If you examine the oscillator section of the coil box you will see that all the wiring to the coils and switch sections is done in a very light gauge of plastic-covered wire. Replace all this, including the connections to the main and bandspread tuning condensers oscillator sections, with 18 or 20 s.w.g. tinned copper wire covered with close fitting spaghetti tubing. I suggest that you do this one wire at a time, so that there is less risk of making an incorrect connection.

Another culprit near the oscillator section is the red plastic covered wire that supplies h.t. to the oscillator valve. This runs across the front of the chassis parallel to the front panel. Rather than replace this, I have found that it can be held to the chassis with a spot of quick-setting glue every inch or two. While you have the glue out, there are quite a few loose looking wires floating about under the chassis that will benefit from the same treatment.

To complete the job, solder pins 6, 7 and 8 of V3, the 6AQ8 oscillator, directly to the chassis. You should now note a distinct improvement in both the mechanical and electrical stability.

One other small change. The original dial globes are rated at 0.15 amp. Replace these with 0.3 amp. globes and you will get much improved dial illumination plus quite a bit of light onto the S meter.

To conclude this series on the Trio, I cannot over stress the importance of correct alignment. On the higher bands, in particular, a reasonable image rejection is dependent on exact alignment. If you do not feel qualified to do it yourself, DON'T. Find someone who can, or take it along to your local Radio Club.

COMMERCIAL INTEREST

One of the things that seems to enthuse owners of the latest Yaesu FTDX-401 and the FT-101 is the most efficient noise blanker. Bail Electronics Services tell me that they can now supply the blanker as a separate item with details on fitting them into the FTDX-400 or FTDX-560. The price is most reasonable. I suggest you get in touch with Bail Electronics for all details.

Slow scan t.v. is taking on like wild fire. Perhaps you would like to be in it, but like a lot of us just have no time to build up the required gear. Stan Dixon, VK3TE, has recently imported a complete set of American Robot slow scan equipment. If you would like to know more about this fascinating aspect of Amateur Radio and also about importing gear for it, contact Stan.

Next month I intend to start a series on the FT-200. Thanks to those who have helped with information and suggestions. If you have carried out any modifications to your FT-200, please let me know so that it can be included.

☆

"20 YEARS AGO"

With Ron Fisher, VK3OM

July 1952.—Why cannot a person be licensed to operate an Amateur Station at the age of 16 years? That was the question that Federal Executive put to us on the Editorial page of the July 1952 issue of "Amateur Radio". F.E. argue of course that a licence should be granted to 16-year-olds. This has of course long been resolved and this Editorial, like many others of this vintage, tells the continuing story of Federal Executive's work, not only for the Amateur but also for the intending Amateur.

July was a lean month for technical articles. However, although there was a lack of quantity, quality was well represented. Some Pointers on Good Quality Phone by the late Dick Dowling, VK3XD, took us through all the requirements to produce good phone—a.m. of course.

The AR301 was a popular piece of disposals gear of the time. Don Haberecht, VK2RS, explained how to get one of these going on 144 MHz. I see that Ham Radio Suppliers were then advertising AR301s at £7/10/- each, complete with three 954s, one 955 and six 6AC7s in the 30 MHz. i.f. stages.

Ken Wall and John Jarman continue Television Made Easy with part nine—Outline of Colour Television. It does not seem to have much relationship to the type we will see in a couple of years, but none the less interesting.

VK4QL reports in his DX Notes that conditions were not good. The new 21 MHz. band had opened up in a disappointing way and the general opinion was that it would be a good band when conditions improve.

The VK2 section of "Fifty Megacycles and Above" reported activity on the 330 MHz. band, but no details of the gear in use.

An excellent description and photo told about VK5WI operating from the Adelaide Exhibition. The impressive set-up included a converted Philips b.c. transmitter for 7 and 14 MHz., plus gear on 50 and 288 MHz. An AR7 receiver was installed for 7 and 14 MHz., but as local noise was a problem a 50 MHz. link was set up to a remote receiving location.

A notable silent key was that of Wal Ryan, VK2TI. Wal was a tireless worker for the N.S.W. Division over more than twenty years. He was a Past Federal Secretary and President and a Life Member of the Institute.

Finally, F.E. were offering free copies of Phil Rand's book on t.v.i. This series was undoubtedly a classic on the subject. I cannot remember who I lent my copy to, but if he sees this he might return it.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

AWARDS COLUMN

With Geoff Wilson, VK3AMK*

The aim of this new section is to introduce Awards issued by the W.I.A. and overseas Societies, and in addition to give information about QSLing, how to apply for Awards, etc. It is felt that there are many people who are uncertain as to just what is available and how to go about getting Awards, which can form a very enjoyable and rewarding part of our hobby.

This month I will discuss QSLs which are a vital requirement for most Awards. Before an Award is issued the applicant must show some form of proof that he has made contact with the stations claimed and the QSL card is still the only really acceptable proof that a QSO has taken place as claimed. QSL cards are today a fairly expensive item and to get value for your money they must meet certain requirements to have any value for Award purposes. Regardless of whether you have a very elaborate multi-colour card or a simple one-colour card, it is only of use to its recipient if you provide certain basic details of the QSO. You may put as much additional material on it as you like provided the details below are included.

During recent years I have checked many thousands of QSLs for various Awards and it never ceases to amaze me that so many people are unaware of the basic information a QSL must contain. Perhaps even more difficult to understand is why so many have cards printed without provision for even the call of the station worked.

The following details must be included:

1. **Your call sign** shown prominently. (Users of postcards please note.)
2. **The words** "To Radio ..... confirming our QSO" **or** "This confirms QSO with ....", clearly showing the call sign of the station worked.
3. **Location of your station** including your full postal address. Remember some stations will not have a current Call Book and otherwise will not be able to send their QSL to you in many instances without this information.
4. **Date and time of QSO.** ALWAYS use GMT.
5. **Band and mode used.** If it was a QSO using the same mode both ways, mark this clearly as many Awards give credit for all one mode.
6. **Signal report** using the standard RST system.

The above list seems simple enough, but how often is a card received which lacks at least one or more of these details, either because there is no provision on the card for it or the operator has not filled it out completely.

The following can be used as a basis for QSL cards and is very simple to fill out while at the same time meeting the above requirements.

YOUR CALL SIGN
YOUR QTH

To Radio ..... confirming our QSO
on ..... MHz. S x ..... at
hrs. GMT on ...../...../.....
Your sigs here were R.... S.... T....

Should you make a mistake while filling out a QSL, **do not scratch it out**, write out another card. Altered QSLs will not be acceptable for Awards as the person issuing the Award may well take the view that the applicant has altered the card to make the information conform with the Award requirements as to date, time, mode, minimum acceptable report, etc.

When ordering QSL cards specify **standard postcard size** as larger cards have to be bent to fit in with bulk handling via Bureaus and arrive in a tattered condition. If sent direct, they require special envelopes and are therefore more expensive.

Most Divisional Bureaus have their own rules for outward cards, check with them re presorting, etc., and you will help speed up the whole handling process.

Remember that many overseas as well as local stations will be depending upon your card to help them towards a particular Award. If your QSL meets all the above requirements you have played your part in helping them to obtain their Award.

[Ed. note.—P.M.G. min. size from 1/10/72 for postcards will be 5½ x 3½ inches. The metric size is A6 at 146 mm. x 103 mm.]

* 7 Norman Avenue, Frankston, Vic., 3199.

STOCKTAKING CLEARANCE SALE

End-of-financial-year Clearance Sale with many special items, also including the standard items advertised regularly this year YAESU MUSEN FT-101, FT-DX-401 and FT-DX-560 Transceivers, MIDLAND Products, HY GAIN and MOSLEY Beams and Multi-band Verticals, CDR Rotators, etc, etc. Bargains galore, make enquiries at the cost of a 7 cents stamp.

Included items like a GALAXY III. Transceiver for $200, a HALLICRAFTERS HT-37 Transmitter for $150, EIMAC 4CX-1000A bottles with special sockets, two 20/40 Metre Yagi Beams for the serious 40 Metre operator, traps to make 20/40 metre elements for those Beams, ex-RAAF aluminium telescoping crank-up Tower, extending to 110 feet, and many more.

Special attention is drawn to the MIDLAND 13-874 5-watt crystal controlled 27-28 MHz Transceivers, solid state throughout which come complete with PTT microphone, 240v AC power supply with built-in 12v DC regulated supply can be used mobile on 12v negative grounded battery, provisions for eight channels, equipped with an S meter/power output meter, built-in speaker squelch control plus a switch to use its own 3-watt modulator as PA amplifier for an external speaker, all for **$80**—including one set of crystals

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MANUFACTURERS OF RADIO AND ELECTRICAL EQUIPMENT AND COMPONENTS

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers

MORSE QUALIFICATIONS

Editor "A.R.," Dear Sir,

Either QSP for May 1972 contains a misprint, or our Federal Council has gone off its collective rocker.

I refer to the 5 (five) word per minute qualification" which our worthy administrators intend to put to the National Regulatory Body, apparently as the unanimous view of the Australian Amateur Radio community.

Who, in his right mind, would postulate 5 w.p.m. as a Morse "capability" of any practical use for everyday on-air communication? As those who use the c.w. segments know, Morse speeds are going up, not down, and DX is being worked at speeds regularly two and three times in excess of the Australian full licence requirement. With a 5 w.p.m. "capability" an Aussie B grader is not going to have the faintest idea what is going on—emergency or otherwise.

Even the simplest of routine c.w. contacts runs to about 25 words, (e.g. salutation, RST, QTH, Name, QRK?, close), so it will take our B grader about six minutes to stumble his way through the over. Whether anyone can or will send him a return over at a speed he will be able to understand, is doubtful.

So where does our proposed B grade qualification fit in?

Accepting that a 5 w.p.m. capability acquired in ideal class room conditions is tantamount to no capability at all in practice, it follows that the W.I.A. proposal is not within the spirit of the International requirement that h.f. band operators have a **usable** skill in Dr Morse's code.

Perhaps the B grade proposal has been set as a sprat to catch the D grade mackerel. If so it is to be hoped that the P.M.G's Dept. administrators will recognise the proposal for what it is—a smart-alec attempt to circumvent the International requirement for a **useful** communications capability, using International Code.

It is regrettable that the Institute Council feels constrained to publicly associate itself (and by implication all VK Amateurs) with another proposal advocating lower standards, at a time when technological and practical trends are clearly in the opposite direction.

If Council feels it must make some act of obeisance to the God of licence numbers and to the minority segment of the Australian Amateur population, it should at the same time recognise that the **competent** "full" licensee's relative privileges need strengthening, e.g. there must be a complementary requirement for the many amongst the 75 per cent. full licence component of the Australian Amateur population, who demonstrate skills far in excess of the current licence standard.

To be constructive, the W.I.A. proposal to be fair and meaningful should equate the proposed new B grade with the existing standards for full licence entitlement, leaving D grade as is. At the same time, the existing full licence should be upgraded to (say) **Extra Class** requiring standards of performance typical of the more skilful element of International Amateurs. Those who can cope with 25 w.p.m. **and** who have substantial non-Amateur (e.g. P.M.G.) qualifications such as Broadcast, Television Station and/or First Class Commercial tickets should be allowed progressive increments in d.c. input, etc.

In other words, Council should not take formal action to request a licence structure biased towards three limited grades and only one qualified grade of Amateur. To do so prematurely might prevent, or at best, unduly delay enhancement of the position of a significant number of skilled and technically competent members of the Institute.

The matter is probably sufficiently important to warrant the taking of a **proper** concensus, before the Institute commits itself to irreversible action.

—Colin Harvey, VK1AU.

EFFECT OF ECLIPSE OF THE SUN

Editor "A.R.," Dear Sir,

On 11th July there will be an important event which I think active Amateurs will be interested. There will be an eclipse of the sun from about 1630 E.A.S.T. to 1904 E.A.S.T. The path of totality is from Sakhalin (Kamchatka) through Northern Alaska, Northern Canada down to the mid-North Atlantic Ocean. The region of partial eclipse is some 30 degrees broad either side of this.

The eclipse will obviously modify the local (Northern Hemisphere) ionosphere as well as modifying the ionosphere at the magnetic conjugate to the path of the eclipse.

The major effects at the conjugate points in the Southern Hemisphere are expected to be on a path running from about Adelaide, East across Bass Strait, then South-East to Antarctica. Effects are anticipated to occur, however, in a broad region about this path. The main effect will be ENHANCED E-LAYER IONISATION in the regions just defined. Amateurs active on h.f. and/or v.h.f. could experience enhanced propagation across this region (or along it) for the period of the eclipse.

—Roger Harrison, VK2ZTB.

☆

THE YOUNG S.W.L.

● **The Editor hopes this little article will be useful for the young beginner and will point a moral for us all. With acknowledgments to Hans Hoppe, writing in "A.P.C.," the monthly newsheet of the Moorabbin and District Radio Club.**

So you are keen on Radio? So am I. To start with, it need not be expensive, as, in the beginning, we only want to listen. Young people are sometimes at a loss on what to do and here are a few clues which might be helpful.

Firstly, a receiver is needed. What shall it be? Commercial, home-made or surplus? This depends on how much money, if any, you have saved or can get. Always try to make your hobbies as cheap as possible and have fun. Remember, we are only amateurs, not professionals.

Have a look in the disposals shops or write to them for details of what you are looking for. Several advertisements appear regularly in "A.R." Look for a set which tunes about 550 kHz. to 18 MHz. or more. This gives you broadcasts as well as the most popular h.f. Amateur bands. Types to look for would be BC348 range 200 kHz. to 18 MHz., AR13 aircraft type 195 kHz. to 9 MHz.; R1155 75 kHz. to 18.5 MHz., BC455 6.00 MHz. to 9.1 MHz. These are a few to think about.

They all use valves, but do not be put off because they require h.t. and l.t. A small p.s.u. for 240v mains to give outputs of 250v or more d.c. at 80 mA. and 6.3v. (or 12.6v.) at say 2a. will usually suffice and can be made up cheaply and easily from suitable bits and pieces. In some cases a simple little audio stage, using perhaps a 6V6 after the detector, and a small speaker will give adequate output. Remember though, whether you use valves or solid state, they both work. Use whichever is cheaper or whatever you can acquire. It is a hobby to have fun with, to explore the ever-changing world of radio, so keep within your limits.

Converters for bands higher in frequency can easily be made up from circuits and details in the various handbooks, especially such beginners' books as the A.R.R.L. 'Understanding Amateur Radio", available to members through W.I.A. Fed. Publications.

Don't be discouraged in your search for knowledge. If you see a set that could be useful, but covered in dust and cobwebs, get busy on it. Do not fiddle with slugs or trimmers until you know what you are doing, and always, but ALWAYS, treat power with care. You, the beginner of today, will be the Amateur of tomorrow with help and understanding from others. Share your knowledge with others; in this way we all learn.

Remembrance Day Contest, 1972

"THE FRIENDLY CONTEST"—12th and 13th AUGUST

CONTEST COMMITTEE NOTES

VHF-UHF contestants will be able to make more than one contact with the same operator on the same band provided that a full two hours elapses from the previous contact on that band. This is intended to enable these operators to carry on for a much longer period, and obtain a larger score, whereas previously most of those in the Contest could be contacted in a few hours. I hope this brings forth a good response from Limited licensees.

To encourage c.w. operation each c.w. to c.w. contact will be worth twice as many points. More notice was desirable but there is still time to find the key and get in some practice.

You will note a variation in scoring to and from the smaller call areas. It is fundamentally wrong for two contestants to both count their contact to the same score. For example, VK4 and New Guinea VK9 contacts score twice for VK4 in the old table. In the new table one point for each contact is allowed, total 2 points, as contacts must not be discouraged.

There was a variation in entry closing times. Irrespective of postal date stamps (so many illegible), entries will be received up to 22nd September. Send by camel train if you wish, but after the 22nd September it will not be looked at. Please get **your** entry in well before that date or I will not be able to cope.

PLEASE ensure that you have your entry with a front page as shown in the Rules. Sorting and listing is so much simpler if "section", "call sign", and "claimed score" can be selected quickly. Use at least a quarto size paper—small sheets tend to get lost in the heap as they are difficult to file.

Within a limitation, Amateurs portable/mobile in other States than their home State may work for their home State in 1972. Naturally contestants wish to score for their own State or Division, but the previous rule laid down scoring for the host State. As a result, quite a few portable/mobile logs were not submitted last year. This, of course, applies to travellers who have their own gear with them and not to those who may wish to use their host's gear.

In 1971 there were only a few contacts on 10 metres but all good contacts. This year I suggest that 1100 hours Z on Saturday and 0100 hours Z on Sunday morning be the start of one hour's calling times for 10 metres.

Remember the reason for the Contest.

The Contest is between VK Divisions. Do your bit for your Division.

Do not forget that at least six high scores are needed for each Division.

Make sure that you and everyone you contact enjoys the Contest. Make it a "Friendly Contest".

—Peter VK4PJ

A perpetual trophy is awarded annually for competition between Divisions of the Wireless Institute of Australia. The name of the winning Division is, each year, inscribed on the trophy and in addition the winning Division will receive a suitably inscribed Certificate.

Because of the excellent relationship between New Zealand and Australian Amateurs, "Kiwis" are invited to participate in this Contest. However, New Zealand operators compete for certificates only and not the Remembrance Day trophy.

OBJECTS

Amateurs in each VK call area will endeavour to contact operators in other VK and ZL call areas, on all authorised bands. Contacts within a call area are permitted on bands of 52 MHz. and above

Contest Date: 0800 hours GMT, Saturday, 12th August, 1972, to 0759 hours GMT on Sunday, 13th August, 1972.

All Amateur stations are requested to observe 15 minutes silence before the commencement of the Contest on that Saturday afternoon. An appropriate broadcast will be transmitted from each Divisional official station during this period.

RULES

1. There are four sections in the Contest:—
   (a) Transmitting, phone
   (b) Transmitting, c.w.
   (c) Transmitting, open
   (d) Receiving, open.

2. All Australian Amateurs are invited to enter the Contest whether their stations are fixed, mobile or portable.

3. All authorised bands may be used and cross mode operation is permitted. Cross band operation is not permitted

4. Amateurs may operate on both phone and c.w. during the Contest, i.e. phone-c.w., phone-phone, or c.w.-c.w., but only one section may be entered. An open log will claim points for both phone and c.w. contacts.

5. One contact per station, per band, only is permitted for scoring, with the exception that a second scoring contact may be made on the same band using the alternate mode. Arranged contacts on other bands are not permitted. On bands 52 MHz. and above, additional contacts may be made with the same station provided that two hours elapses after the previous contact with that station on that band.

6. Any operator may enter one log only, and multi-operator stations are not permitted. Although log-keepers are permitted, only the licensed operator is allowed to make contact under his own call sign. Should more than one operator wish to use any station each will be considered a separate contestant. Such contestants shall be referred as "substitute operators" for the purpose of these Rules and their operating procedures must be as follows:

Phone: Substitute operators will call "CQ RD" or "CQ Remembrance Day", followed by the call of the station they are operating, then the word "log" followed by their own call sign, e.g. VK4BB log VK4AA.

CW: Substitute operators will call "CQ RD" de VK4BB/VK4AA.

Contestants receiving the signals from a substitute operator will qualify for points by recording the call sign of the substitute operator only.

7. Contestants must operate within the terms of their licence.

8. **Cyphers:** Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures will be made up of the RS or RST reports plus three figures, starting at one, that will increase in value by one for each successive scoring contact.

9. **Entries** must be set out as shown in the example, using one side only of the paper, and no smaller sheet than quarto. Envelopes to be marked "Remembrance Day 1972" and forwarded to—

Federal Contest Manager,
W.I.A.,
Box 638, G.P.O.,
Brisbane, Qld., 4001.

Entries must be forwarded in time to open on 22nd September. Early entries will be appreciated. Late entries will not be handled.

10. Scoring will be based on the table shown.

Portable/Mobile operation: Log scores of operators working outside their home call area will be credited to their home call area provided that operation takes place in only one call area and contacts with their home call area do not count for scoring purposes. Otherwise scoring will be as for the host call area.

11. All logs **must** carry a **front sheet** showing the following information:

(Continued Next Page)

EXAMPLE OF TRANSMITTING LOG

Date/ Time GMT	Band	Emission and Power	Call Sign Worked	RST No. Sent	RST No. Received	Points Claim.

Note.—Standard W.I.A. Log Sheets may be used to follow the above form.

Name ..... Section .....
Address ..... Call Sign .....
Claimed Score .....
No. of Contacts

Declaration: I certify that I have operated in accordance with the Rules and spirit of the Contest.

Signed .....

Date.....

12. All contest contacts made must be shown including non-scoring invalid contacts. Logs in the open section must show c.w. and phone contacts in numerical sequence.

13. The Federal Contest Manager does not expect to exercise his right to disqualify any entrant who, during the Contest, has not observed the Regulations or who has departed from the accepted code of operating ethics, nor does he wish to disallow any illegible, incomplete, incorrect or late logs.

14. The ruling of the Federal Contest Manager is final and no disputes will be discussed.

AWARDS

Certificates will be awarded to the top scoring stations in Sections (a) to (c), Rule 1, of each call area and will include the top scorer in each Section of each call area operating exclusively on 52 MHz. and above.

There will not be an outright winner for Australia or New Zealand. Additional certificates may be awarded by the Federal Contest Manager.

The Division to which the Remembrance Day Trophy will be awarded shall be determined in the following way.

To the average of the top six logs shall be added a bonus arrived at by adding to this average the ratio of logs entered to the number of State licensees, including Limited licensees, multiplied by the total points from all entries in Sections (a), (b) and (c) of Rule 1.

$$\text{Average of top six logs} + \left\{ \frac{\text{Logs entered}}{\text{State licensees}} \times \begin{matrix}\text{Total Points}\\ \text{of Sections}\\ \text{(a), (b), (c)}\end{matrix} \right\}$$

VK1 scores will be included with VK2, VK5 with VK8, and VK0 with VK7. Also VK9 scores will be added to the Division which is geographically nearest. Note that in the scoring table contacts made between call areas who summate their scores count points.

Acceptable logs for each Section shall show at least five valid contacts.

The **Remembrance Day Trophy** shall be forwarded to the winning Division in its container and will be held by that Division for the ensuing period.

RECEIVING SECTION (d)

1. This Section is open to all Short Wave Listeners in Australia, but no active transmitting operator may enter.

2. Contest times and loggings of stations on each band are as for transmitting

3. All logs shall be as set out in the example. The scoring table to be used is the same as that used for transmitting entrants and points must be claimed on the basis of the State in which the receiving station is located. Refer to the sample log. It is not sufficient to log a station calling CQ—the number he passes in a contact must be logged.

It is not permissible to log a station in the home call area of the receiving station on the 1.8-30 MHz. bands, but on bands 52 MHz. and above stations in the home call area may be logged for one point on each occasion.

4. Except for 52 MHz. and above, a station heard may be logged once on phone and once on c.w. for each band.

5. Club receiving stations may enter for this Section of the Contest and if sufficient entries are received an award will be made to the top entry in Australia and New Zealand.

6. Certificates will be awarded to the highest scorers in each call area provided a minimum of four entries are received from that call area.

SCORING TABLE

From \ To	VK0	VK1	VK2	VK3	VK4	VK5	VK6	VK7	VK8	VK9	VK9	ZL1	ZL2	ZL3	ZL4	ZL5
VK0	–	6	6	6	6	6	6	6	6	6	6	2	2	3	4	1
VK1	6	–	1	1	2	3	5	4	6	1	5	2	2	3	4	6
VK2	6	1	–	1	2	3	5	4	6	1	5	2	2	3	4	6
VK3	6	4	1	–	2	1	4	3	6	5	5	2	2	3	4	6
VK4	6	3	1	2	–	3	6	5	4	1	3	2	2	3	4	6
VK5	6	5	2	1	3	–	4	3	1	6	6	2	2	3	4	6
VK6	6	6	2	1	4	2	–	3	5	1	6	2	2	3	4	6
VK7	1	5	1	1	3	2	5	–	5	6	6	2	2	3	4	6
VK8	6	5	1	1	2	1	6	4	–	3	3	2	2	3	4	6
VK9	6	1	1	2	1	4	1	6	1	–	–	2	2	3	4	6
VK9	6	5	1	2	3	4	5	6	1	–	–	2	2	3	4	6
ZL1	6	3	1	1	2	3	5	4	6	5	5					
ZL2	6	3	1	1	2	3	5	4	6	5	5					
ZL3	6	3	1	1	2	3	5	4	6	5	5					
ZL4	6	3	1	1	2	3	5	4	6	5	5					
ZL5	1	5	2	1	4	3	5	1	6	6	6					

Read table from left to right for points for the various call areas.

There are two columns and lines for VK9. Use the lesser figure if the call areas are adjacent and/or scores summate. For example, New Guinea VK9 and VK4 are adjacent and summate for the trophy score, so count one point, but New Guinea VK9 and VK6 are not adjacent and do not summate so count five points.

In addition to the above table, all intrastate contacts on 52 MHz. and above are worth one point each.

CW scoring: All c.w.-c.w. contacts carry a multiplier of two. Insert the final figure in your log.

REPEATER IDENTIFIER

(Continued from Page 5)

DITS Dec.	DITS Bin.	DAHS Dec.	DAHS Bin.	STOP Dec.	STOP Bin.
1	000001	4	000100	36	100100
2	000010	6	000110		
3	000011	8	001000		1 Stop
7	000111	14	001110		
10	001010	21	010101		
11	001011	24	011000		
12	001100	28	011100		
13	001101	33	100001		
16	010000	34	100010		
18	010010	35	100011		
19	010011				
22	010110		10 Dahs		
23	010111				
25	011001				
27	011011				
29	011101				
31	011111				
32	100000				

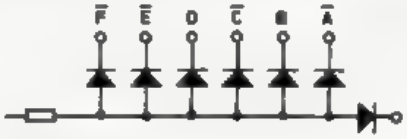
18 Dits

There are six digits in the binary representations of each number, so we will require a six-stage ripple carry counter. Let the outputs of each flip-flop be A, $\overline{A}$, etc., as shown in Fig. 4. Now since A, $\overline{A}$ is the most significant digit, the number represented on the ripple carry counter is of the form

F E D C B A

e.g. 0 0 1 0 1 0

If we require one of the AND gates in the diode matrix to produce a 1 output for the above number, we must connect the six inputs of the gate to logical 1 for that number and for that number only. Since $\overline{Z}$ = NOT (Z) it is simply achieved by connecting to Z where a 1 occurs in the number, and to $\overline{Z}$ where a 0 occurs in the number. For the above example we would connect $\overline{F}$ $\overline{E}$ D $\overline{C}$ B $\overline{A}$



For VK4EI/R2 we have 29 × 6 = 174 diodes plus 28 to prevent interaction, making a grand total of 202 diodes.

No doubt the more astute reader will have counted only 89 diodes in Fig. 5. This was achieved by a logical network simplification procedure known as a Karnaugh map. The use of Karnaugh maps would require a course in logical design which is somewhat beyond the scope of this article. (The author's usual fee for Karnaugh map simplifications is 50 guineas.)

So there it is, a completely solid state automatic repeater identifier that produces an output when the repeater transmitter has been on the air for 4.5 minutes and for every 4.5 minutes after that until the transmitter goes off air.

If the transmitter goes off air before the end of a 4.5 minute period, the timing circuit is reset to zero. The device thus complies with P.M.G. requirements. ●

DIVISIONAL NOTES

DIVISIONAL DIRECTORY

OFFICERS, 1972/73

(Note—Officers refer to the Division of their call sign)

Patrons: VK5QJ, VK7HQ.

Presidents: VK2ACV, VK3IZ, VK4ZBV/T, VK5TY, VK6HD, VK7EJ

Secretaries: VK2AM, VK3AZT, VK4VV, VK5KF, VK6NE, VK7CL.

Treasurers: VK2ZIA, VK3YQ, VK4UC, VK5TL, VK6EU, VK7VK.

Federal Councillors: VK3GN, VK3OR, VK4ZGL, VK5TY, VK6NE, VK7EJ.

Vice-Presidents: VK1 2YB, 2ZIM, 3YQ, 4IE, 5RG, 5QO, 6DD, 6DC

Council Members (additional): VKs 2ZDD, 2ZGW, 3ZIU, 3AJV, 3AXF, 3CDR, 3NT, 3ZA, 3ZCK, 3ZDW, 4AK, 4EV, 4HB, 4NP, 4VU, 4XG, 4ZST, 5GZ, 5NB, 5RG, 5XV, 6BY, 6DA, 6LO, 6PG, 6RU, 6ZJF, 7AK, 7CL, 7JV, 7MD, 7VK, 7ZAS, 7ZMK.

Federal Executive: President VK3KI, Vice-President VK3QV, Editor VK3ARZ, VKs 3DM, 3ADW, 3AGZ; Secretary VK3CIF.

VICTORIA

BAND PLANNING
VHF REPEATER FREQUENCIES
PROPOSALS FOR CONSIDERATION

The VK3 Division Repeater Committee, headed by Peter Linden, VK3BX, recently called two meetings—the latter on 3rd June at the direction of Divisional Council.

At the last meeting all interested users of the 144-148 MHz. band were invited to attend to generally discuss the future frequency requirements of repeaters, determine their compatibility with existing simplex channels, and frequencies to be used by stations in the Amateur Satellite Service.

The meeting adopted a system proposed by Ian Yandell, VK3ZIY, which is shown in the Table below which deserves close study.

TABLE 1

(Note all Repeaters 600 kHz. spacing between input and output freq.)

Freq. MHz.	Simplex Exist.	Simplex Future	Repeaters Revised	Repeaters Future	Satellite
145.85	Ch. A	—	—	—	Yes
145.80	—	—	—	—	Yes
145.95	—	—	—	—	Yes
146.00	Ch. B	—	—	—	Yes
146.05	—	Yes	—	—	—
146.10	—	—	Ch. 1 in	—	—
146.15	Ch. C	—	—	—	—
146.20	—	—	Ch. 2 in	—	—
146.25	—	—	—	Ch. 5 in	—
146.30	—	—	Ch. 3 in	—	—
146.35	—	—	—	Ch. 6 in	—
146.40	—	—	Ch. 4 in	—	—
146.45	—	—	—	Ch. 7 in	—
146.50	Ch. S	—	—	—	—
146.55	—	Yes	—	—	—
146.60	Ch. T	—	—	—	—
146.65	—	Yes	—	—	—
146.70	—	—	Ch. 1 out	—	—
146.75	—	Yes	—	—	—
146.80	—	—	Ch. 2 out	—	—
146.85	—	—	—	Ch. 5 out	—
146.90	—	—	Ch. 3 out	—	—
146.95	—	—	—	Ch. 6 out	—
147.00	—	—	Ch. 4 out	—	—
147.05	—	—	—	Ch. 7 out	—

It should be noted:—

(1) That the repeater input frequencies remain the same and are the lower frequencies, and the repeater outputs are the higher frequencies.

(2) All present known simplex channels are preserved, as well as individual specialised net frequencies in VK3.

(3) The Amateur Satellite Service world wide has endeavoured, by general agreement to have the frequencies between 145.85 and 148.00 MHz. kept relatively free of constant use communication channels.

(3) The present repeater output frequencies (your receive frequency) could also be utilised for simplex operation by purchasing the corresponding transmit crystal.

The meeting recognised the cost to existing users of having to update their receiving crystals, for repeater operation, but believes that action taken now has the two-fold effect of rationalising 2 metre operation in terms of conflicting requirements and makes better use of the spectrum available to us in this part of the world.

FUTURE ACTION

These recommendations have been forwarded to the Federal Repeater Secretariat and the Federal Band Planning Committee recently formed from members of this Division to assist Federal Council.

In the same way as the recommendations from the Wodonga Conference on Repeaters became a nationally adopted procedure, it is to be hoped that this proposal finds favour in a similar manner.

The latest band planning arrangements in Region 1 (Europe) where the band 144-146 MHz. ONLY is available is as follows —

144.00 — 144.15 MHz.	CW
144.15 — 145.90 MHz.	CW, Phone
145.90 — 146.00 MHz.	Beacons, Satellite
146.00 — 145.25 MHz.	Repeater inputs
145.50 — 145.85 MHz.	Repeater outputs also mobile, RTTY, SSB, calling chan.

(Courtesy cable from G2BVN)

—P. D. Williams, Pres., Vic. Div.

SOUTH AUSTRALIA

Glad news at last. The Divisional Council has been given permission by the Thebarton Council to formulate a plan for use of the Walter Burly Griffin designed establishment on their property. This central location should prove ideal for section meetings, storing of components and materials, and housing of the official VK5WI transmitter. Conversion plans have been approved by the general meeting and have been submitted to the Thebarton Council so, hopefully, almost certainly, the dream of a home for VK5WI is coming true at last; thanks to the hard work of the site investigation committee. The outline of the changes will appear in the journal.

As a final passing note, just a reminder about the VK5 intrastate contest scheduled for early August.

—Dave VK5GZ.

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NEW TYPE OF BATTERY

It is announced that P. R. Mallory & Co. Inc. has been granted an exclusive world-wide licence to manufacture and market lithium organic batteries under the patents and technologies of American Cyanamid Company.

J. David Ehlers, managing director of Mallory Batteries (Australasia) Pty Ltd., said, "The Company plans initially, under the licence, to concentrate on the further development and manufacture of a three-volt lithium organic battery with characteristics considered especially suitable for government-related portable power applications. The battery has exceptionally high energy density, constant voltage discharge characteristics, a long shelf life and can be used over a wide range of environmental conditions."

Mr Ehlers said that Mallory Batteries (A'sia) Pty. Ltd., a subsidiary of P. R. Mallory & Co. Inc., U.S.A., will market those products in Australia in 1973. The parent firm, The Mallory Battery Co. (U.S.A.) is establishing a pilot line facility in Tarrytown, N.Y., to produce several cell sizes of lithium organic batteries.

Mr. Ehlers said, "Mallory also is developing other lithium battery systems, including a family of solid-state batteries with rating of from 20 to 200 volts, or higher. These batteries have potential use in medical electronics, time pieces, military devices and in other applications where high voltage density and reliability are required."

OVERSEAS MAGAZINE ABSTRACTS

March 1972.—Converting the T 278/U Transmitter to 2 mx, Converting the ART-13, Improving Your HR-2, Twelve Channels with the Regency HR-2, Morse Centennial, Updating an Old Receiver, Solid-State Tuneable I.F., Part 2, Checking Zener Diodes, Putting the ARC-3 on Two; Blown Fuse Indicators; Nonlinear Resistors, Constant Current Charger for Ni-Cads, The ESM/1 Transceiver; Low-Cost Transistor RF; Updating the W1PLJ Counter; Simple Diode Controller; Low-Pass Filter in Action.

April 1972.—200 Watt 2 mx Amplifier, Using the Drake TR-22; An Auto-Bandwidth Selector Unit, Customised AFSK-MCW-Code Practice Oscillator, Using the LM373; Repeater Site Alarm; T44 Base Station Conversion, The HR-2 as a Base Station, FM Repeater Guide; Electronic Symbols and Abbreviations, 73 Tests the Comcraft, Ross and White Transceiver, Ionospheric Effects of Thunderstorms.

"QST"

March 1972.—An SSB and CW Transverter for 220 MHz., HF Propagation Estimation for the Radio Amateur; A Dual-Voltage Medium-Current Power Supply for Repeaters, Dual Polarisation DX Antennas; The VE2HN Digital CQer, Broadband Solid-State Power Amps. for SSB Service, Noise Generators; Review: Curtis EK-402 Electronic Keyer.

"CQ"

May 1972.—CQ Yeti—Ham Radio at the Top of the World; An Improved Calibrator using Solid-State Techniques, General Purpose Wide Band Amplifier, Direct Etch Resist for Printed Circuits; Noise and Noise Generators, Part 1; Safe and Easy Field Day Antenna Raising.

"RADIO ZS"

March 1972.—Twenty Metre Band Spurious in the FTDX-100; Transistorised Capacitor Discharge Ignition System.

"HAM RADIO"

February, 1972.—Digital Readout Station Accessory, Solid-State Driver and Final for 40 and 80 Metres, The TR-144 Transverter for Two Metres, Third Generation Solid-State HF Converter, Pre-Emphasis for SSB Transmitters, Modular Receiver for Two Metre FM; A Simple Crystal Checker, Calculating the Inductance of Toroids.

March 1972.—Ecology Linear; Solid-State 2304 MHz. Converter, 455 kHz. Filter for Amateur FM, Improved Two Metre Pre-Amplifier; Reciprocating Detector; Monitoring SSB Signals; Digital Station Accessory, Part 2.

"BREAK-IN"

April 1972.—Re-learning the Code; Annual Report and Accounts, etc.

"RADIO COMMUNICATION"

April 1972.—A Hand Portable Transceiver for 70 MHz., Crystals for Carfones and Other Things (Reprint from "A.R.," May 1971); A 9 MHz. Crystal Filter for Amateur SSB; A Switched Z-Match Aerial Unit; A Scaffold Tilt-Over, Microwaves; RF Probes, Review of RCS Type 501 Timer/Counter.

"SHORT WAVE MAGAZINE"

March 1972.—Top Band Transverter for Transceiver Operation, Using the Roller Coaster Coil Unit; The Phase Locked Loop, Loading up a Wire for Top Band.

—VK3ASC.

you and DX

With Don Grantley*

Times: GMT

Having just spent a few short days in VK4, it is not a very pleasant task to have to return to the cold VK2 climate, sit in a freezing shack and attempt to compile these notes. But all is not lost, I hope to move to the Sunshine State before the end of the year. My apologies to my many friends up there, I had to make a hurried business trip, thus had no time to renew acquaintances, but better luck next time. At least the DX was good up there, which is more than I can say for the conditions in this part of the world.

Many strange prefixes have appeared during the month of May. C2HED on May 17 was a special operation for Nauru Constitution Day, and was operated by C21TL, Box 32, Nauru. SK2XA on May 26-28 by Kiruna Radio Club, celebrated the arrival of the Midnight Sun. SK0ITU was on for World Telecom Day, QSL to SK6CC. WM2GK QSL to K2NP. WM4SFC QSL to K4BFT. WP6JPL QSL to W6ZGC, were special stations, whilst WU3SNA, QSL to W1ADO, was the Armed Forces Day operation from the Annapolis Naval Academy.

9H3WTD was a special exhibition station, QSL to 9H1N. KA6DO is ex-KR6DO, using his new prefix. (KR6 Ryukyu now counts as Japan as from May 15 in most lists). EI0DMF from Dundalk May Festival May 12 to 21, manager is EI2I. HW8ULT is a special I.T.U. station, QSL to F9OE. KD4USA was Armed Forces Day operation from Sth. El Monte, California. SX0E/72, QSL to SV1EN, Box 1443, Athens, was QRV from the Electron 72 Exhibition. Another I.T.U. station was KE4ITU, QSL to K4ZA. U4L was the Lenin Memorial Station by Ulianowsk Club Station UK4LAA, QSLs to UA4LN. A special call WP6JFL was used for reasons unstated in May, QTH Box 282, Barstow, Cal., 92311.

The prefix XQ is being used by CE stations on 21 MHz only during Unctad 3 Conference whatever that may be. The 6D4 prefix is now in use for Ravilla Gigedo.

A note to hand from "Monitor" re YA1RG states that Wolfgang has now returned to Germany, and should now be QRL as YA1RG/DL Folfgang Renner, 34 Gottingen, Friedenestr, 25, Germany. He is still award manager for the Afghanistan Radio Award and the Camel Drivers Ten Award, but all other YA material should go to Box 278, Kabul.

BV2AA is in the news again. I have often stated that I doubt their authenticity, and it is now reported by Geoff Watts that the A.R.R.L. will not accept these QSLs for DXCC as the station is unlicensed, QSO reports are relayed by other stations and there is a strong possibility that "BV2AA" is located in Japan. His name is Nong (which could mean anything) and his manager is JH1HWN, Hiromichi Katsurashima, 2136-33 Zamairiya, Zama-machi Koza-gun, Kanagawa, Japan. BV2AB has been reported closed down by the government. In passing, 2AA is often in the Pandora's Net 14287 Mondays at 0430z.

There has been a recent spate of activity from HB0, several stations were in operation over almost a month, ending at the beginning of June. HB0XJL and XJK had DJ1BW as manager. XJQ was managed by K3SSC, XIW by DJ5CD, XIZ by WB8FQZ, XJG by WA4WME, and XJJ by DL7HZ.

KC6WS and KC6YL, now back in the States, have finally received their logs from the West Carolines, and will be pleased to answer any outstanding QSLs. Their home QTH is W. Sendore, W5SZV, 3224 Bob-O-Link Lane, Denton, Texas, 76201.

UK1ZFI is active from Franz Josef Land at the time of writing. The operation is by UR2AR and UR3DW, who ask that all cards go via the Central Radio Club, Box 88, Moscow. Other Russian stations of interest include UA1GZ/M from Vostol, UPOL 19 USSR Ice Station "North Pole 19" cards for which go to UW3HY at Box 88, Moscow. UK1OAH/1 from Solovetskie Is. and UK0BAC from Dickson Is. The /M suffix indicates an Antarctic station.

Pacific Stations.—Many interesting stations are active in this area at the present time and here are a few of them with their QSL information where possible. KB6DA (W6CUF), KC4DX operation now completed from Navassa Is., QSL to W4GKF or Box 11555, Atlanta, Georgia, 30305. KX6EB usually on 14035 c.w. about 1900z, QSL to KX6DC. VR1AC (K3HLY), VR1W and KB6DA on from British Phoenix. YJ8HV (G3RV), and YJ8GH (W6ANN) both active, the latter often on sked with ZL2AMI or ZL1AUJ on 40 mx at 0615 usually on 7220. VS5PW is often in the South-East Asia Net 14336 s.s.b. daily, he is Capt. Paul White, RBMR Berakas Camp, Bandar Seri Begawan, Brunei.

Allan G3WUW is currently active from 9M6AB 14160 and 14340 mainly on week-ends at about 1600z onwards. He planned to move on to VS5AP then 9M6WUW, QSLs for all three calls go to JA2KLT, however Allan may be contacted in the area for a year at the following address, A. Papworth, Decca Survey Co., Topo Dept., Brunei Shell Petroleum, Seria, Brunei. From the same, 9M6BA and 9M6TJZ should soon appear. The latter has the same QTH as 9M6AB, while 6RA is Barney Avery, manager, O'Connors Sdn., Bhd., Box 1197, Kota Kinabalu, Sabah, East Malaysia.

Don't pass up that log entry with the official I.T.U. station for that contact that you had on World Telecom Day, or during the period from May 6 to 13 as their special QSL is one worth adding to any collection.

Darleen WA6FSC will shortly marry Joe HC2OM, and is hoping for the call HC1YL. As Darleen is a most reliable person where a QSL is concerned, maybe I will now get that HC QSL which has been eluding me for 20 years.

WA2BAV and WB2AQC recently completed their West African travels, which included operation from TU4AB. They have returned home where their address is George and Eva Patake, 34-34 74th Street, Jackson Heights, New York, 11372, U.S.A.

VB2KOC, which was active during the Newfoundland State Convention of the Knights of Columbus from May 19-21, served a double purpose, as well as being a strange prefix, it also enabled many more contacts with the elusive Zone 2.

Often when tuning over the bands I wonder just what is happening to them. There are so many intruders on twenty these days that it is just not funny any more. The position in the UK evidently has the authorities worried, for I note that the R.S.G.B. have been allotted an official Intruder Watch Station GB3IW. I have heard recordings of some of the rubbish which inhabits 28 over in G land, and it leaves ours for dead. It is all very well to record, identify and report these menaces, but I firmly believe a few solid well placed watts do far more to shift these chaps than all the reports in the world. Without getting on my pet soap-box, how about a little of this to these contest spoilers.

Short Skeddings.—TX3BK has a new manager W8LUJ. Bob Stark, W3OLG, manager of VR6TC, passed away recently. G3XEC, manager for MP4MBC has a new QTH: 26 Plumian Way, Belsham, Cambs CB1 6EG. KZ5EK QRV 20525 or 21290 Saturday and Sunday 1300-1600z. ZP1WE replies quickly if QSLs are sent to Box 440, Grand Cayman. GB3IOS from Scilly Isles May 27 to June 27, QSL to G3TBS. CT2BC now has a new manager, WA2BCK, from May 5.

Note.—A reminder on a couple of the more interesting and productive nets. The British Commonwealth Net now on Summer QRG 21304 s.s.b. Monday to Friday 1430, with Net Control G3LQP. On Saturday and Sunday the time is 1000z same frequency, control is G3SUW. The Arabian Nights Net meets Mondays 14290 1900, Thursdays 21305 at 1500z, and Fridays 14190 at 0730z. The African Net meets daily on 21335 at 1900 with net control being W2PPG, whilst the ZL/VK/African Net appears on Saturday and Sunday 21225 at 0700 with ZL1BEX or VK2PA in the chair. (2PA, is that still you, Perce?)

At this stage we run out of space. My thanks to Geoff Watts DX News Sheet and Monitor for notes in this issue.

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Book Review

THE RADIO AMATEUR'S HANDBOOK

1972 Edition

Radio technology has been changing at a rapid rate and the 49th edition of this popular Handbook has been revised extensively. Thirteen chapters have been re-written to cover new devices and techniques. The book has been completely re-organised to make material easy to find. This new edition contains an additional fifty pages and covers digital logic devices, linear ICs, h.f. and v.h.f. antennas, broadband amplifiers, filter networks, converter designs and s.s.b. techniques. Two hundred new drawings and charts have been included to present the current state of the art in all areas of Amateur communications.

Published by A.R.R.L., available from Divisions or from Fed. Publications. —VK3ASC

IONOSPHERIC PREDICTIONS FOR JULY 1972

The predictions for July from charts supplied by the I.P.S. are listed below. It is of interest to note that the MUF, in most areas, has dropped to around 25 MHz. at the peaks. 10 metre DX operation from VK is almost non-existant, and will probably remain this way for at least four months.

The best opportunities for DX is still on 20 metres, but don't overlook 15 metres during the daylight hours.

Last month a survey among a small cross-section of Amateurs was taken to discover the reaction to the change in format of the predictions, and all Amateurs interviewed unanimously agreed that the new presentation is for the better. The Editor would greatly appreciate receiving by mail your comments regarding the predictions.

Note.—VK4 is Townsville, VK0 is Macquarie Island and all times stated are E.A.S.T.

28 MHz.—

VK4 to	KH6			1300-1500

21 MHz.—

VK1/2 to	ZL		minus 4	1100 plus 4
	VE3	SP		1300
		LP	minus 1	1000 plus 1
	W6		minus 5	1300 plus 5
	VK0		minus 5	1300 plus 3
	5Z	SP	minus 1	1700 plus 2
		LP		0700, 1700
	ZS		minus 2	1700 plus 1
	G	SP		1800
		LP	minus 1	0800 plus 1
	VU		minus 1	1200 plus 8
VK3 to	UA		minus 3	1700 plus 3
	F	SP		1800 plus 1
		LP		0700 plus 2
	VK0		minus 3	1300 plus 3
	I	SP		1500-1900
		LP		0800
	ZL			0800-1600
VK4 to	KH6			0700-1900
VK5 to	KH6			0700-1800
	JA			0800-1800
VK6 to	ZS			1500-2100
	G	SP	minus 1	1900 plus 2

14 MHz.—

VK1/2 to	ZL			0700-1800
	SP	SP	minus 2	0900 plus 10
		LP	minus 2	0800 plus 3
	VE3	SP	minus 3	1400 plus 2
				[illegible]
		LP	minus 1	1000 plus 6
	W6			1200-0300
	PY		minus 3	0800 plus 4
	VK0		minus 6	1300 plus 6
	VK6			0900-1800
	5Z	SP	minus 1	0900 plus 3
			minus 2	1700 plus 2
		LP		1200-2000
	ZS		minus 3	1700 plus 4
	VU			1000-1300
				1900-2400
VK3 to	VK6			0900-1600
	UA			0700-1200
				2000-2400
	F	SP		0800-1300, 2300
		LP		0700-2000
	VK0			0800-1900
	G	SP		0800-1300
				2200-2400
		LP		0700-2000
	I	SP		0800-1400, 2300
		LP		0700-2000
VK4 to	KH6			0800, 1300-0300
VK5 to	KH6			1300-0400
	JA			1600-0300
				0700-1100
VK6 to	W1			2100-0300
	ZS			1400-2300
	G	SP		0900-1400
				2100-0300
		LP		0900-2300

7 MHz.—

VK1/2 to	ZL			1600-0700
	SP	SP		1500-2100
	VE3	SP		1600-2000
		LP		0900
	W6			1600-2400
	PY		minus 1	0700 plus 1
				1500-2100
	VK6			1700-0900
	ZS			2400-0900
	G	SP		0200-0700
		LP		1500 plus 1
	VU			2300-0800
VK3 to	VK6			1700-0900
	F	SP		0400-0800
		LP		1500 plus 1
	VK0			1800-0600
VK4 to	KH6			1700-0300
VK5 to	KH6			1700-0300
VK6 to	W1			1900 plus 1
	ZS			2400-1100

Smoothed monthly sunspot number predictions for July 48, August 47, September 46, October 44. Swiss Fed. Observatory, Zurich.

* P.O. Box 222, Penrith, N.S.W., 2750.

VHF UHF
an expanding world

With Eric Jamieson, VK5LP*

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	50.100	VK0MA, Mawson.
	53.280	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.825	VK3ZQC, Mce South.
VK4	52.400	VK4WI/2, Townsville.
	144.350	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.008	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.350	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

It seems that this column, together with similar columns in the "Victorian VHFer" and the new N.S.W. "6 Up" all beat the gun regarding the frequency change of the VK6VF beacon from 52.008 to 52.200. It appears that this proposed change will take place at some period this year but not just at present, so the beacon is currently listed again on its former frequency. I have also received a letter from Neil Penfold, Secretary of the W.A. Div. of W.I.A., the contents being as follows and self explanatory: "Please note that the VK9 beacon on Christmas Island is not operative, and is not likely to be for some time. The equipment has been "taken back" by the D.C.A. for other work." Thanks, Neil, now we know.

While on the subject of beacons, Mike VK-2AM mentions that an application for a licence for the proposed VK2 beacon has been filed for some time. A tower is available, the present repeater antenna is at the top and the beacon antenna/s will be mounted underneath. Final frequencies have not yet been determined, but may operate on selected frequencies until a band plan by the new W.I.A. Band Planning Committee is put forward. This last sentence gives me a good excuse to once again mount the soap box and re-iterate my own views on my favourite subject—beacons—that all two metre beacons should be located above 144.500 MHz, but not above 145 MHz. This places them in the second 500 kHz. tuning range of the average transceiver out of the way of DX contacts which are invariably to be found in the first 300 kHz., still within a useful working area (gain) for antennas such as the popular 10 element yagi, and also where most converters have a useful performance. Some specially designed narrow bandwidth jobs may have some difficulty in doing well when tuned to the second 500 kHz. but then these converters as a rule are designed for a specific purpose and would not normally be used to listen for beacons anyway. Let us hear from you if you have something useful to say on the matter, and certainly get your case ready for a hearing by the Band Planning Committee.

50 MHz. IN THE U.S.A.

A copy of a letter from Victor Frank, WB-6KAP to KH6HK has come into my hands and briefly states that on 29th March the six metre Amateur band was open from 2100-2300 GMT from Northern California and much of the United States to Central and South America. Rusty XE1PY reports daily openings to South America from Mexico City since March 1 beginning as early as 1830 GMT and remaining till 2300 GMT, also evening transequatorial openings to LU, CE and HK starting about 0030 GMT. Since mid-March he had been receiving and recording the field strength of Australian and New Zealand t.v. video carrier frequencies near 46.250 and 45.250 MHz. respectively. They had been in (weakly) at various times between 2100 and 0300 GMT, not necessarily simultaneously.

The ZK1AA beacon in Rarotonga, Cook Islands, has been off since mid-December, but is expected to be on from a new location on 50.101 and 40.661 MHz. In addition, Stuart is preparing to put a beacon on 52.5 MHz. in Suva, Fiji, 3D3AA, starting this summer (one-way only, however). The WB6KAP six metre beacon on an **attended** basis was licensed until June 21. WB6KAP seeks reports of reception of his or ZK1AA beacons. He monitors 50.101 MHz. continuously by tape, chart, and/or speaker during the last 25 seconds of each minute. (The beacon transmits the first 30 seconds of each minute, but the 18th of each hour). He listens near 51 and 52 MHz. also and can be reached on 14.032 MHz. after his 0300 GMT schedule with ZK1AA.

The above comments upon VK/ZL t.v. stations being heard in U.S.A. may be some "consolation" to those who are off the air whilst Channel 0 is transmitting—at last some use has been found for the signals.

Lance VK4ZAZ/T has added another confirmation to his VHF WAS Certificate, this being from Bill KH6HK in the Marshall Islands, who runs 140 watts a.m. to a 6 element beam about 40 feet high. Receiver a Collins 51J4 and converter. Lance's list of countries now extends to about 10, so congratulations are in order for a fine effort.

TWO METRE OPENING

An air of expectancy hovered over VK5 on 31st May. The night before Garry VK5ZK reported hearing the tropospheric beacon at Albany on 135 MHz. 5 x 9 at 2330. The next night (Sunday) did not appear very prospective early in the evening. However, a telephone call from Bob VK3AOT asking me to get the VK3s on the air as he was hearing the VK5 beacon resulted in several phone calls, a message on Channel 4, and the band opened up.

Not a great deal was heard down on the Adelaide plains, Mick VK5ZDR worked VK-3ZOO, and there was not much else. Tony VK5ZDY from his home mountain site at Stirling was pulling them in thick and fast and is known to have worked nine VK3s and three VK7s. Not sure whether he worked Allan VK2ZEO in Deniliquin. This sort of thing was too much for Bob VK5ZDX and Garry VK5ZK who quickly went portable near Mt. Lofty and used Bob's mobile running 50 watts input to a 3 element fox hunt beam, 6CW4 converter to a double converted 6 to 9 MHz. Command receiver. From their portable site they worked three States, VK2, 3 and 7, signals varied from 5 x 3 to 5 x 9.

Stations to be heard included VKs 2ZEO, 3YER, 3ZL, 3ZUT, 3ALZ, 3AKC, 3AOT, 3AMH, 3ZKN, 7JV, 7ZAX and 7ZAH. John VK7JV worked Eric VK3ZKN by the long path, through the Adelaide Channel 4 repeater. Jim VK-5ZMJ in Port Pirie was heard working VK3AMH Ballarat, about 440 miles, which is good going for a contact from non-elevated sites. For my part, I had to be content with hearing VK3ZOO and not being able to contact him!

MOONBOUNCE SUCCESS

Congratulations are the order of the day for the Dapto Moonbounce project workers for their success on 432 MHz. A lengthy report in the VK2 "6 up" (first issue) carries the details. On 31st March, 1972, the first E.M.E. test was carried out, and regular echoes were received for a period from 2130. The strength of the echoes varied up to 2 to 3 dB. above noise level, using a 2.1 kHz. receiver passband. On 18th April a sked with WA6HXW was not successful, but on the 19th, VK2AMW was hearing WA6HXW running 3 to 4 dB. above the noise and copying partial call signs. Full call signs from VK2AMW were being copied by WA6HXW. However, no reports were exchanged as the Dapto Group did not realise that reception of a full call sign, in parts, during one transmit session constituted a contact. Another sked was arranged for 14th May.

TRANSEQUATORIAL PROPAGATION

The following by Roger Harrison, VK2ZTB, of the Ionospheric Prediction Service, and printed in "6 Up" is worthy of the wider coverage that "Amateur Radio" can give it, particularly as TEP contacts will be more and more sought after as Amateurs improve their equipment and so much more band watching takes place. The item is headed "Propagation Dissertation": "A number of fallacies seemed to have crept into the Amateur journals and on-the-air discussions concerning Sporadic-E and TEP openings on 6 metres. I have noticed a tendency for some people, who should know better, to call strong, steady openings with distances in excess of 2,000 miles (i.e. working Cook Island, Nauru or Guam) F-layer openings. Also openings to Japan in the afternoon (distances of 5,000 km. to 8,000 km.), which tend to exhibit strong steady signals with little or no fading, are often called F-openings. I don't know how these conclusions are arrived at, but they are rubbish!

"Two-hop Es is not uncommon and distances up to 2,600 miles (about 4,000 km.) can be covered. Exceedingly few openings occur where the F-layer MUF rises above 50 MHz. for a single-hop path. Even fewer occur for a double-hop path. Afternoon openings to Japan are supported by Class 1 TEP which involves a 'chordal-hop' or 'supermode' propagation mechanism. Class 1 TEP certainly involves propagation via the F-layer but it is a special mode—one which as yet cannot be included in normal predictions. Afternoon-type TEP is rarely seen in VK2 and points South, as the propagation mechanism does not normally allow distances longer than about 9,000 km., generally symmetrically situated normal to the magnetic equator, VK2s, VK3s, and VK7s have to rely on an Es openings and TEP occurring simultaneously."

SKEDS WANTED

In addition to the requests last month from VK3YBE, VK2AM, VK2ZQJ for skeds with other stations covering various types of operation and bands. Now also is noted a request from Ian Berwick, VK3ALZ, 107 Loongana Ave., Glenroy, Vic., 3046, for meteor scatter skeds, particularly to VK4 and northern VK2. Runs 150 watts input on c.w. to 31-ft. long quad-yagi on 144.050 MHz. You might also note that VK7ZAA at Burnie and VK7EM at Penguin have a sked at 2000 hours every Tuesday night on 144.150 MHz. approx. VK3s and any others hearing them are welcome to join in.

VK3 VHF-UHF CW CONTEST

Details are to be released soon of a c.w. contest for our bands, and cross mode contacts are being considered to allow Limited licensees to join in. Some incentives might also be considered to get a few stations out portable, too—they might then be heard interstate.

VK3 VHF DX CONTEST

Plans are presently being drawn up for an annual contest during August with rules similar to those of the VK6AU sponsored VHF DX Contest last year. Proposed dates of operation are 4th to 20th, which includes the "R.D." Contest and some meteor showers.

2300 MHz. EXPERIMENTS

2300 MHz. experiments between Dick VK-2BDN and Bill VK2ZAC have come to a standstill at present due to Dick being laid up in hospital. We all hope he will soon be well enough to continue. Both were disappointed with the results of trying to monitor Apollo 16 transmissions, mostly wide-band, which were not suitable for copy by their equipment. Further attempts are to be made with Apollo 17.

BEACONS—AGAIN!

From I.A.R.U. Region 1 News Bulletin are a few beacons which might interest some readers. 28.185 MHz. GB3SX; 28.200 DL0IGI; 28.000 DL0AR; 50.100 ZS6VHF; 50.500 ZC4VHF; and 3B8MS in the 28 MHz. band. The two 50 MHz. beacons mentioned will be of most interest to VK, as they may be heard by someone some day. The 28 MHz. beacons may be pointers to a rising MUF, that's about all.

TWO METRE ANTENNAS

Of considerable interest in the April issue of the "VHFer" are the results of the recent 2 metre antenna gain measuring test. The best performance was put up by a 13 element yagi on a 24-ft. boom, giving a F/B ratio of 10 dB. and a forward gain of 14 dB. and entered by Bob VK3AOT. In all, 35 antennas were tested, and the list of performances makes interesting reading, the lowest performance being from a particular 5 el. yagi with a —12 dB. gain! The value of tuning up a yagi correctly was indicated by one 13 el. on a 24-ft. boom which had a gain of 3 dB. Yagi antennas are not hard to get going reasonably well, but not too many liberties in departure from standards laid down for many years can be taken unless you are really clued up on antennas, and then you might not make anything better.

My spies inform me that Ian VK3ALZ has developed a quad-yagi on a 33-ft. boom with a measured gain of about 19 dB., and with this Ian is reputed to be able to copy the VK7 beacon at reasonable strength when no one else in Melbourne is able to hear it. Details are now awaited by many.

That's all the news for this month—not a lot of people have written, but some interesting publications come to hand regularly each month and what might interest you is taken from their pages. Thought for the month: "It is truly not the value but the worth of a thing that is important, as in the case of an inexpensive but strategically placed button."

—The Voice in the Hills.

* Forreston, South Australia, 5233.

SILENT KEY

It is with deep regret that we record the passing of—

VK3ANX—N. R. Heinrichsen.

INTRUDER WATCH

It is interesting to read of the I.A.R.U. Region 1 Intruder Watch activities, and in "Radio Communication" of April 1972, commenting on the conference held in the Dutch resort of Scheveninger, near the Hague, it has this to say:

"Colin Thomas, G3PSM, the R.S.G.B's Intruder Watch Organiser and the Region 1 Co-ordinator, has written a paper dealing with the past and future of the Intruder Watch, an activity in which the R.S.G.B. has led the world of Amateur Radio. G3PSM will personally introduce his paper and in off-duty hours endeavour to spread the idea of a complete European participation in Intruder Watch activities."

The formation of I.A.R.U.M.S. (International Amateur Radio Union Monitoring System) was also to be a topic for discussion.

I wonder if in Region 3 the various countries will become as organised? From the lack of co-operation thus far extended it would seem that Australia is the only country taking the matter seriously.

Alf Chandler, VK3LC,
Fed. Intruder Watch Co-ordinator.

— • • • —

W.I.A. 52 MHz. W.A.S. AWARD

Amendment:

Cert. No.	Call	Additional Countries
102	VK4ZIM	5

— • • • —

COOK BI-CENTENARY AWARD

Late entries have been received from the following stations and Awards issued:

Certificate number 1488 DM2BTO, 1489 DM-2AUF, 1490 SP9PT, 1491 CE0AE, 1492 JA1WPX.

AROUND THE TRADE

In a recent press release N.S. Electronics Pty. Ltd. announces the availability of the latest issue of the FR Electronics Reed Switch Catalogue containing general information on the use and application of reed switches together with a fold-out for use as a wall chart. The latter is also available on request. Details are included on contact suppression and the use of reed switches in coils and with permanent magnets. Requests can be made direct to the Company (mentioning this brief report) or through the Business Manager.

* * *

Hy-Q Electronics Pty. Ltd. announces the appointment of Mr. Guy Thornton as National Sales Manager covering the Australasian area. Mr. Thornton was Divisional Manager of the Telecommunications Division of Pye, New Zealand, prior to his transfer of residence to Australia.

* * *

"The Little Red Book of the Electronics Industry" from Dick Smith Electronics Pty. Ltd., of 10 Atchison St., St. Leonards, N.S.W., 2065, is to hand. Their catalogue is very comprehensive and well produced, it contains a wealth of useful information in addition to acting as a back-up for their very prompt service of guaranteed quality merchandise. Their service includes an automatic telephone answering and recording machine in use for STD calls after 6 p.m., for actioning the following morning.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	320/344	VK4VX	300/300
VK6RU	318/344	VK5AB	295/314
VK4KS	311/326	VK2APK	293/300
VK2AHO	310/326	VK4FJ	286/307
VK4UC	303/303	VK4TY	284/288
VK6MK	303/334	VK4PX	281/282

New Members:

Cert. No.	Call	Total
130	VK3JF	104/104
131	VK4LZ	110/110
132	VK3SO	104/104
133	VK3AKR	125/125
134	VK3XD	104/104
135	VK6LK	216/216

Amendments:

VK3AMK	241/241	VK4NQ	124/124
VK4XJ	165/169	VK5WV	120/120
VK4QA	130/130		

C.W.

VK3AHQ	310/326	VK3NC	273/300
VK2QL	305/328	VK6RU	285/288
VK3YL	290/307	VK3YD	283/282
VK2APK	289/297	VK4TY	259/272
VK4FJ	289/315	VK3TL	254/260
VK3XB	285/300	VK3RJ	251/265

Amendments:

VK3KS	247/254	VK4XJ	145/151
VK4VX	242/242	VK3LV	123/123
VK3JF	194/201		

OPEN

VK6RU	318/344	VK4TY	306/321
VK4SD	315/330	VK4UC	303/303
VK4KS	312/331	VK6MK	303/334
VK2VN	311/330	VK2EO	301/325
VK2APK	307/319	VK2SG	288/304
VK4VX	307/307	VK4FJ	297/323

New Members:

Cert. No.	Call	Total
139	VK3SO	108/108
140	VK3JF	205/212
141	VK3XD	107/107
142	VK4LZ	124/124
143	VK4KX	221/221
144	VK9LV/ G5RV	140/140
145	VK9BA	134/134

Amendments:

VK3XB	291/306	VK3HE	152/153
VK4PX	288/283	VK4NQ	136/136
VK4XJ	204/211	VK3LV	123/123

KEY SECTION

This month's magazine carries Rules for the 1972 Remembrance Day Contest, and you will notice that a multiplier has been provided for c.w.-c.w. contacts to make this mode of operating of similar weight to phone in state totals. it would be nice to be proved wrong in the selection of this factor by immense scores being piled up in the c.w. segment of the Contest, even if equality with the talkers would be more diplomatic.

On the subject of Contests, there were no starters at all in the newly-restored c.w. section of the Ross Hull. Is July far enough in advance of December for giving notice to instal a key socket in the old 2 mx rig? Plans being hatched for a c.w. award would make a couple of contacts in the Ross Hull worthwhile.

If anyone has tit-bits which might interest other c.w. operators, let me know and I will try and get them in this column. QRX August, 73, Deane VK3TX.

HAMADS

- **A free service for individual members.**
- **Four lines of print free (200 characters/spaces); full charge at $6 (min.) per col. inch if exceeded or for repeats: includes name/address—use QTHR if correct in Call Book.**
- **Copy, please in typescript if possible, and signed.**
- **Excludes commercial-class advertising.**
- **Exceptions only by PRIOR arrangement.**

For full details see January 1972 "A.R.." page 23.

FOR SALE

Cheltenham, Vic.: Pre 1968 components including two Geloso VFOs, tuning condensers, 12v. DC relays, etc. Any reasonable offers. VK3LV, QTHR, Sunday mornings only.

Melbourne, Vic.: Complete Geloso Model 225 SSB, CW, AM Transmitter, 160-200 watts PEP with Model 226 Power Supply, 80-10 metres. Superseded model but in new condition, $345 FOR. Bob Cunningham, VK3ML, QTHR, Phones 20-7780 or 329-9633.

West Pymble, N.S.W.: Swan Transceiver, AC and 12v. mobile PSU, matching speaker box, desk mike, all mint condition. $425. VK2AOW QTHR. Phone (02) 449-3538 AH.

Greenwich, N.S.W.: Galaxy GT550, P/S, remote VFO, $550. Also HD Transformer $35. VK2AGO, QTHR. Phone (02) 43-2427 AH.

Downer, A.C.T.: Heathkit SB400 Transmitter, as new, $295. BC348 Rx, original condition, 110v., PSU, $65. VK1JL, QTHR. Phone (062) 49-7830.

Melbourne, Vic.: Collins 75S3B Receiver. Serial 85489, complete with regular 2.1 kHz. mech. filter, also 500 and 1500 Hz. filters. Absolute latest of S line, new six months ago, used two months. Rare opportunity for most discriminating buyer. Roth Jones, 1 Albert Rd., Melbourne, Vic., 3004.

Eastlakes, N.S.W.: 122 Rx Tx, 1.8 to 10 MHz., with Crystals, mic. and h/phones. Class B linear for above. PSU and spare, $25 o.n.o. Phone 663-7336, Tony Smith, 151/3 Slattery Place, Eastlakes.

Kew, Vic.: 40-foot Oregon Pole, $10. VK3ADL, QTHR, Phone (03) 86-5871.

WANTED

Riverton, W.A.: Yaesu DC-200 DC Power Supply for FT200. VK6LK, QTHR. Phone (092) 57-2202.

Nowra, N.S.W.: AR88 Receiver in good condition with handbook. VK2AJT, QTHR. Ph. (044) 22786.

Brisbane, Qld.: Split-stator Tx type capacitor 2 x 250 pF. or similar twin-tub, or single 500 pF., or both, suitable Z-match coupler. Mervyn VK4SO, Box 1513, G.P.O., Brisbane, 4001. Ph. (072) 2 2831 bus.

Concord, N.S.W.: Pre 1930 radio periodicals such as Wireless Weekly, Radio in Australia and N.Z., Wireless World, QST, etc., for Amateur Museum. VK2AAH, QTHR, Ph. (02) 73-2369.

Canberra, A.C.T.: 6 metre converter, preferably solid state. Contact J. Campbell, 6 Parer St., Scullin, A.C.T. Ph. (062) 541-548.

BAIL ELECTRONIC SERVICES *for your Amateur Station requirements*

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★ **M-200 Mobile** "under-dash" **Bracket Set** for FT-200 **$12**
★ **FT-101** latest **Transistorised Transceiver**, complete with mic. and power cables **$675**
★ **FT-570 de luxe Transceiver** with noise blanker, fan and speaker. New model, similiar FTDX-401 **$615**
★ **FLDX-400 Transmitter**, 80-10 mx, 300w. peak input **$436**
★ **FRDX-400 de luxe Receiver**, 160-10 mx, mechanical filter. A high quality Communications Rx .. **$428**
★ **FL-2000B Linear Amplifier**, 80-10 mx, 2 x 572B tubes, standard cabinet **$438**
★ **FL-2500 Linear Amplifier**, 160-10 mx, 4 x 6KD6 tubes, standard cabinet **$345**
★ **FL-2100 Linear Amplifier**, 80-10 mx, 2 x 572B tubes, cabinet matches FT-101 .... **$438**
★ **FTV-650 6 metre Transverter**, S2001 (6146B) PA **$175**
★ **FT-2F 2 metre FM Transceiver**, 10w., fully solid state, with mic. and power cable **$275**
★ **FP-2AC AC Power Supply** for FT-2F, includes speaker and battery charger **$75**
★ **YC-305 Frequency Counter**, 6 digit capability to 30 MHz. **$360**
★ **CDE AR-22R low-cost Rotator**, 220v. AC controller **$55**
★ **CDE Ham-M heavy duty Rotator**, 220v. AC control. **$145**
★ **Hy-Gain Model 400 Rotator**, for the big beams and stacked arrays, 110v. AC controller **$239**
★ **Special Eight-Conductor Cable** for Ham-M, per yd. **60c**

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★ **TH3JR Triband Beam**, 3 element **$118**
★ **TH3MK3 Triband Beam**, 3 el. Senior Model for higher power **$188**
★ **TH6DXX Thunderbird** 6 el. **Triband Beam** **$235**
★ **203BA** Monoband 3 el. **20 mx Beam** **$178**
★ **204BA** Monoband 4 el. **20 mx Beam** **$198**
★ **153BA** Monoband 3 el. **15 mx Beam** **$85**
★ **18AVT Trap Vertical Antenna**, 80-10 mx **$75**
★ **14AVQ Trap Vertical Antenna**, 40-10 mx **$49.50**
★ **12AVQ Trap Vertical Antenna**, 20-10 mx **$38**
★ **BN-86 Ferrite Balun**, 1:1 52 ohm, 1kw. DC **$22**
★ **LA-2 Lightning Arrestor**, special, for co-ax cable **$8.75**
★ **Large stock** of Mobile Whips and Mounts, Hy-Gain centre loaded type and Mark Mobile Helicals; VHF Antennas and Beams. Please advise your requirements.

★ **Newtronics 4BTV Trap Vertical Antenna**, 40-10 mx **$49.50**
★ **Newtronics 4BTV-80**, as 4BTV but with resonator coil and tip rod to extend coverage to 80 mx **$75**
★ **Mini Products B24/RK3 Minibeam**, 3 el. compact Triband Beam **$125**

ACCESSORIES

★ **SWR-2 SWR Bridge**, 50 ohm, dual meter type **$20**
★ **ME-11-K SWR Bridge**, 50 ohm, dual meter, large size with calibrated power meter **$30**
★ **A & R Baluns**, ferrite toroid, 400w. PEP:
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★ **CB-330** Tuneable Hi-Amp. **Generator Filter** **$9**
★ **PS-750 Polyphase** (USA) 5-position **Co-ax Switch**, with SO-239 Sockets **$21.50**
★ **Casion Digital Clocks**, 24-hr.:—
Wall type with large figures **$24**
Desk type with day and date **$25**
★ **EK-26 Katsumi Electronic Keyer**, with paddle and built-in monitor **$59.50**
★ **MC-22s Katsumi Speech Compressor** **$28**
★ **AT-3 Katsumi** RF actuated **CW Monitor** and Code Practice Audio Oscillator **$16**
★ **EKM-1 Katsumi** Code Practice **Audio Oscillator** **$8**
★ **TE7-01 Omega Antenna Noise Bridge**, few only left **$32**
★ **HN-31 Heathkit Dummy Load Kit**, 1 kw. 50 ohm **$26**
★ **SBW-610 Heathkit Monitorscope**, wired and tested **$230**
★ **Replacement Meters** for K-109 SWR Bridge **$9**
★ **Mic. hand-held PTT** with "curly" cord, 50K dynamic **$16**
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★ **CW Crystal Filter** **$39**
★ **Cooling Fan** **$25**
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★ **160 mx Modification Kit** **$19**
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★ **External Speaker**, SP-101 .. .. **$28.50**
★ **External VFO**, FV-101 .... **$118**

● All Prices Include S.T. ● Freight is extra. ● 90-day Warranty, except valves and semiconductors.

Add $1.00 P.P. on small items, clocks, switches, etc. Larger items, sets, antennas, etc., are despatched air freight interstate, rail intrastate. Write us for quote.

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Prices and specifications subject to change.

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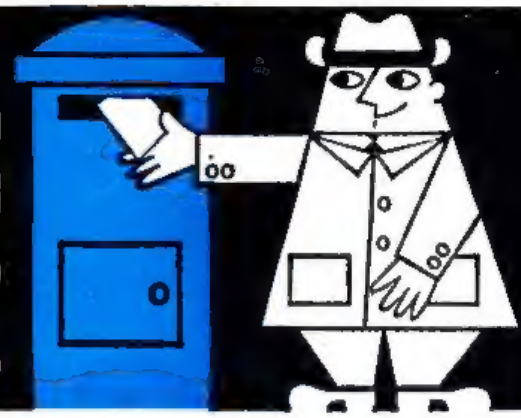
South Aust. Rep.: **FARMERS RADIO PTY. LTD., 257 Angas St., Adelaide, S.A., 5000.** Telephone 23-1268
Western Aust. Rep.: **H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152.** Telephone 60-4379



MULTIMETERS FOR AMATEURS

SPECIALS—CHECK THESE LOW PRICES

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D.C. V.: 0.6, 3, 12, 60, 300, 600, 1200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.012, 0.3, 6, 60, 600, 12A.
OHMS: 1 Ω to 20 MΩ in 4 ranges.
SIZE: 7" x 5¼" x 2½".
PRICE: **$30.40** + 15% sales tax.

MODEL SK7: 4K O.P.V.

D.C. V.: 10, 50, 250, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 0.25, 10, 250.
OHMS: 10 Ω to 2 MΩ in 2 ranges.
SIZE: 4⅞" x 3½" x 1½".
PRICE: **$8.80** + 15% sales tax.

MODEL M303: 30K O.P.V.

D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 2".
PRICE: **$17.50** + 15% sales tax.

MODEL SK120: 20K O.P.V.

D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 1¾".
PRICE: **$14.50** + 15% sales tax.

MODEL F75K: 30K O.P.V.

D.C. V.: 0.25, 2.5, 25, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500.
D.C. mA.: 0.05, 10, 250.
OHMS: 1 to 8 megohms in 3 ranges. Inbuilt Signal Injector.
PRICE: **$18.50** + 15% sales tax.

MODEL TP5SN: 20K O.P.V.

D.C. V.: 0.5, 5, 50, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.

D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.

D.C. V.: 5, 25, 50, 250, 500, 2,500.
A.C. V.: 10, 50, 100, 500, 1,000.
D.C. mA.: 2.5, 250.
OHMS: 1-6 MΩ in 2 ranges.
SIZE: 4½" x 3¼" x 1⅛".
PRICE: **$12.00** + 15% sales tax.

MODEL TS-60R: 1K O.P.V.

D.C. V.: 15, 150, 1,000.
A.C. V.: 15, 150, 1,000.
D.C. mA.: 1, 150.
OHMS: 1K to 100K.
SIZE: 2¼" x 1¼" x 3½".
PRICE: **$6.75** + 15% sales tax.

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